

## **Part III – Ecosystem Protection Issues**

**Benthic Habitats**

**Big Sur Coastal Ecosystem**

**Davidson Seamount**

**Emerging Issues**

**Introduced Species**

**Krill Harvesting**

**Special Marine Protected Areas**



## **Benthic Habitats Action Plan**

### **Goal Statement**

To maintain the natural biological communities and ecological processes in the MBNMS, by evaluating and minimizing adverse impacts of bottom trawling in benthic habitats while facilitating the long-term continuation of sustainable local fisheries in the Sanctuary.

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### **Introduction**

The Monterey Bay National Marine Sanctuary is dedicated to collaborating with the public in its effort to protect the marine environment. In the ten years since its designation, researchers, managers, and community members have helped the Sanctuary to identify resource protection issues and strategies to augment our management scheme. As part of the Sanctuary's management plan review process, these recommendations were honed through a series of scoping meetings and public workshops. Fifteen specific issues that were of principal concern to the public and the Sanctuary were identified as areas for discussion in a working group context. The effects of bottom trawling on benthic habitats has been a frequently raised concern and one which the Sanctuary has agreed to address as an important part of this process.

The Sustainable Fisheries Act of 1996 required that fishery management plans describe and identify essential fish habitat (EFH) and address how it is affected by fishing activities. The seafloor has thus become an area of acute environmental concern and a focus of scientific research. Legal challenges have been brought alleging that the Fishery Management Councils, who help implement the Sustainable Fisheries Act have not adequately addressed this issue. Additionally, the Councils generally address habitat issues on a species-specific or species-assemblage basis. By contrast, the Monterey Bay National Marine Sanctuary is concerned not only with the nexus between habitat and the health of a particular species, but with the role the benthic habitat plays in the health of the ecosystem. Therefore the Sanctuary is looking to

address both the direct and indirect effects on seafloor habitat that can result from the fishing practice of bottom trawling.

International studies have examined the direct effects of bottom trawling including the incidental killing of benthic and demersal species, and mortality caused by increased vulnerability to predation. Increased food availability is another direct effect as trawling creates fish offal, discarded fish, and dead benthic organisms that provide food for scavenging species. Indirect effects include reductions in the total biomass of target fish, which could be expected to affect predators, prey, competitors of a target species, and overall seafloor community structure. These downstream consequences also encompass potential changes in the flow of materials and energy through ecosystems and shifts in the balance of production and consumption.

Bottom trawling is widely believed to adversely affect benthic habitats based on numerous scientific studies. In the MBNMS there is an incomplete picture about the extent of these impacts within the Sanctuary and the potential need for local protective action. In a 1994 report, the National Research Council stated, “Habitat alteration by fishing activities is perhaps the least understood of the important environmental effects of fishing.” Since that report was published, there has been extensive research done on the effects of trawl gear on the seafloor. However, the inherent difficulty in studying offshore habitats, and the problems associated with determining causation under shifting environmental conditions (current, temperature variation, natural migration, storm activity), have left many questions unanswered.

Both despite and because of the uncertainty that remains, the use of trawl gear is a source of concern for the Sanctuary. This is due in part to the potential modification of the substrate, the possible disturbance of benthic communities, and the removal of non-target species. There has been little research conducted within the Sanctuary boundaries, however, a 1998 study indicated the occurrence of many of these suspected impacts.<sup>1</sup> There is also a perception that declines in many traditional fisheries could lead to increased efforts to find under-exploited fish populations in less accessible, previously unfished areas. These efforts would be facilitated by the development of new types of gear and navigational aids, possibly exposing new regions of the continental shelf, slope, submarine canyons, and seamounts to the effects of bottom trawling.

### **Statutory and Regulatory Context**

There are currently specific area closures in the MBNMS imposed by state and federal fishery management agencies, including the depth based limitations related to new restrictions in the groundfish fishery. There is also a state ban within three nm of the mainland with an exception (originally for foul weather) allowing trawling up to one nautical mile from shore between Yankee Point and Point Sur. There are also exceptions within the MBNMS for the shrimp fishery allowing trawling up to two nm from shore north of Pigeon Point. While these closures provide de facto protection of benthic habitat, they are spatially and temporally limited and do not represent comprehensive long-term protection for future generations.

The National Marine Sanctuary Program recognizes that the primary regulatory authority over fisheries management resides with California State Fish and Game Commission, PFMC and NMFS, and will work to encourage these agencies to take the necessary measures to protect Sanctuary resources. In making any management recommendations, the MBNMS would consult

with these agencies, as well as affected fishermen to determine an appropriate course of action. While regulation of fishing activities in federal waters is the jurisdiction of PFMC and NMFS, identifying essential fish habitat and designing effective protective strategies has proven to be a difficult goal for the Council to achieve on such a coast-wide geographic scale. It is a task that may be more effectively addressed by an approach that is more regional in its application and more ecosystem oriented in its perspective. PFMC is required by the Magnuson Stevens Act to manage fisheries based on fisheries management plans. These plans focus on individual stocks or species-assemblages and in so doing do not adequately consider the impact of the fishery on non-harvested species. The National Marine Sanctuary Act focuses on protection of the ecosystem as a whole, a field in which the Sanctuary Program has 30 years experience. Addressing the issue of the effects of trawling on benthic habitats is therefore a legitimate means for the Sanctuary to both meet its mandate and promote an ecosystem based perspective to fisheries management. The Sanctuary thus seeks to assess the potential impacts bottom trawling may have on its resources, and to develop appropriate strategies to protect the marine environment.

### **Action Plan Development**

The work group will develop a framework plan to gather data on the types and extent of trawling activities and their impacts to the benthic layer and the associated living marine resources other than the targeted species during trawling activities. The plan will also provide for the examination of impacts related to bottom trawling, the assessment of the adequacy of protections afforded by the current regulatory framework, and as needed will recommend protective measures with which the Sanctuary will approach fishery management agencies. The order of the strategies of the plan is not necessarily to be performed sequentially and the Sanctuary will likely engage in many of the described activities simultaneously. However, certain issues may need to be researched or resolved before the direction of subsequent steps can be determined. The layout of the plan recognizes this approximate chronology. The plan will focus on bottom trawling, however, the working group members have said they believe other types of fishing activities, such as seining, may impact the benthic habitat of the Sanctuary and should also be addressed. The Sanctuary may investigate similar habitat impact issues related to these fisheries in the future but this plan does not specifically address them.

## **Strategy BH-1: Partnerships with Fisherman**

### **Strategy Description**

Fishermen have a wealth of knowledge not only about their fishery but also about the physical and biological environment. The Sanctuary recognizes that tapping into this knowledge base is critical to obtain quality information regarding the extent and potential impacts of bottom trawling. Recent regulations have been dramatic and have had severe economic impacts on trawlers. These are an example of the kind of reactive regulation that the Sanctuary seeks to avoid by finding means to conserve the resource and the fishery simultaneously. Working cooperatively with fishermen is the only way to effectively accomplish this goal.

### ***Activity 1.1: Engage Fishermen to Work with the Sanctuary to Address Impacts from Bottom Trawling***

MBNMS staff fully appreciate the challenges associated with this activity. Given the recent regulatory actions, fishermen may be reluctant to engage in a discussion on this issue. However, the Sanctuary has worked to create partnerships with fishermen in the past and would continue to draw from, and build on these relationships. The Sanctuary would work with fishermen to help identify potential impacts from bottom trawling and find workable solutions. This type of coordination will in part be conducted through the “Incorporating Fisheries Issues in Research and Education” action plan.

*Status:* Phase 1

*Potential Partners:* Alliance, PCFFA, local trawlers, Sea Grant, FMA

## **Strategy BH-2: Assessment of Trawling Activity**

### **Strategy Description**

In order to determine when and where trawling is taking place, the Sanctuary will need to examine a number of existing indicators. The Sanctuary and its partners will evaluate the need for recommending measures that would improve the quality of the data available. Existing tools will be utilized to determine where and when trawling is taking place including landing receipts, log books, and anecdotal information.

#### ***Activity 2.1: Compile Fishing Data***

MBNMS staff will work with fisherman to compile existing log book, landing receipt, and anecdotal information regarding where, when, and what kind of trawling has been taking place in the Sanctuary. In an effort to hone potential management recommendations, the Sanctuary will facilitate gathering all of the existing relevant fisheries data on bottom trawling. Some of this information will be incorporated into a map or series of maps that depict closed areas and the spatial and temporal extent of trawling. In addition to looking at current trawling activity, this project will examine annual trawl data from 1994 to July 2002 to account for changes in effort and regulation. It would also describe what types of gear have been recently used in the Sanctuary including net size, boat size, homeport, etc.

*Status:* Phase 1

*Potential Partners:* CDFG, NMFS, PFMC, PSMFC

#### ***Activity 2.2: Evaluate Effect of Current and Projected Regulations on Future Fishing Effort***

Based on license data, the Sanctuary will facilitate the assessment of the capabilities and potential impacts of a full scale fishery including potential displacement from other areas. Determining the number of potential participants will help establish the spectrum of effort that can be applied in Sanctuary waters. This will affect the range of potential impacts on benthic habitats. This analysis will also evaluate the potential for a shift to factory vessels, the impact of buyback programs, retiring permits, ITQs, IFQs, and the potential revision of existing regulations.

*Status:* Phase 1

*Potential Partners:* Regional research institutions, CDFG, PFMC, NMFS

#### ***Activity 2.3: Improve Data Gathering***

MBNMS Staff will evaluate the need for and potential design of a more refined system of gathering data. The current forms of information provide relatively coarse data regarding the spatial and temporal extent of trawling. The Sanctuary will examine the data collected by fishery management agencies including the degree of resolution in the start and stop points of trawl lines. The Sanctuary will assess the need for recommending measures that could produce more refined data that would help managers to effectively manage and protect resources.

*Status:* Phase 2

*Potential Partners:* Regional research institutions, CDFG, PFMC, NMFS, local trawlers, Sea Grant.

***Activity 2.4: Generate Cultural Profile and History of the Bottom Trawling Industry***

Trawling is one of the oldest fisheries in the rich fishing culture of central California. However, the number of trawlers operating in the region has decreased over the years as increasingly restrictive regulation and declining stocks have forced some out of business while discouraging others from entering the fishery. The Sanctuary will create a cultural and historical profile of trawling in recognition of the region's fishing tradition and to preserve the history of the fishery.

*Status:* Phase 2

*Potential Partners:* Local trawlers, historians

### **Strategy BH-3: Identify Habitats Vulnerable to Trawling**

#### **Strategy Description**

The level of adverse impacts to benthic habitats from trawling depends on the vulnerability of the specific habitat. The Sanctuary will examine what habitats are particularly susceptible and identify these locations within its jurisdiction.

#### ***Activity 3.1: Consult Literature and Scientists to Develop Criteria for Selecting and Prioritizing Habitats Vulnerable to Effects of Bottom Trawling***

The Sanctuary will work to identify vulnerable habitat types and will address them in the order of their susceptibility to the adverse impacts of bottom trawling. The Sanctuary's partners will help establish criteria for this process.

*Status:* Phase 1

*Potential Partners:* Regional research institutions, NMFS, USGS.

#### ***Activity 3.2: Consult with Local Scientists, Fishermen, and Primary Literature to Determine What and Where Vulnerable Habitats are Located***

There is an extensive amount of international research focused on the effects of trawling in benthic habitats. The Sanctuary in partnership with local scientists and fishermen will seek to identify what habitats within the Sanctuary are vulnerable and what the specific impacts are likely to be. Vulnerability will be established in part by reference to stressed local species

*Status:* Phase 1

*Potential Partners:* Regional research institutions, NMFS, USGS, NURP, Local trawlers

#### ***Activity 3.3: Gather Existing Data on Habitat Distribution and Incorporate into GIS Format***

There are several existing mapping projects that have focused on portions of the Sanctuary. These include work by USGS, MLML, CDFG, and CSUMB. The Sanctuary will generate a series of habitat maps that depict where vulnerable habitats are located and the level of threat posed by trawling activity.

*Status:* Phase 1

*Potential Partners:* Regional research institutions, NMFS, USGS, CDFG

#### ***Activity 3.4: Evaluate the Need for Additional Habitat Distribution Data and Research, and Develop Strategy to Obtain and Conduct it Where Necessary***

The Sanctuary will assess if the available habitat information in areas where trawling is occurring is sufficiently refined to support management recommendations. If not, the Sanctuary will identify data gaps and will work with local scientists to design research projects that target these needs.

*Status:* Phase 2

*Potential Partners:* Regional research institutions, NMFS, USGS, CDFG



## **Strategy BH-4: Management Tracking Program**

### **Strategy Description**

Trawlers are heavily restricted by a maze of regulations and exceptions. In order to assess the risk of adverse impacts to benthic habitats and to recommend appropriate management strategies, the Sanctuary and community members helping with this action plan must have a comprehensive understanding of the current regime. Additionally, given that regulations are subject to alteration, the Sanctuary must be able to stay abreast of regulatory and statutory changes.

#### ***Activity 4.1: Compile Database of Regulations and Restrictions***

The Sanctuary will work with fishery management agencies to compile the relevant regulations and restrictions and incorporate this information into a series of GIS maps. Having an easily accessible and updateable database is critical to making informed decisions and in identifying important issues. Much of this work has been done by NMFS and CDFG. The Sanctuary would offer its support to the Department in its continued evolution. Additionally, the Sanctuary would incorporate the information into its own GIS program to manipulate and update information as needed.

*Status:* Phase 1

*Potential Partners:* CDFG

#### ***Activity 4.2: Track Changes in Regulatory Environment***

The Sanctuary will seek to partner with fishery management agencies to address mutual concerns and interests, and will create a means for staying apprised of the current and pending regulatory environment. Developing a relationship with fishery management agencies early in this process will be critical to forming effective an effective partnership and will help the Sanctuary stay apprised of the current regulatory setting. Staying up to date will require that the Sanctuary allocate sufficient staff resources to the issue and maintain relationships with fishery managers who can keep the Sanctuary current in regards to regulation changes and pending management action.

*Status:* Phase 2

*Potential Partners:* CDFG, NMFS, PFMC

## Strategy BH-5: Impact Identification and Research Program

### Strategy Description

This strategy recognizes the need to articulate what the potential impacts are to benthic habitats from trawling. Being as specific as possible in this regard will help ensure that any remedial action recommended will be narrowly tailored and as effective as possible at addressing Sanctuary concerns. Additionally, clearly identifying impacts will help design specific solutions that have as little impact as possible on the economic viability of commercial fishing within the Sanctuary. Information gaps will be identified and research projects to address data needs will be pursued with Sanctuary partners.

### ***Activity 5.1: Identify Impacts from Bottom Trawling in MBNMS***

The Sanctuary will draw on the scientific expertise of the working group and local scientists to create an inventory of local impacts from trawling. Identifying the extent of some of these impacts will be the subject of additional activities focusing on research needs. However it is important to generate a preliminary list of known impacts in order to guide plan development and to allow the Sanctuary to address issues while data needs are identified and more information is obtained. The following is an initial list of direct and indirect impacts from trawling that will be augmented by future discussion and research:

Direct...

- A. Altered ecosystem function due to removal of target species
- B. Incidental mortality of non-target species
- C. Alteration or damage to habitat
- D. Increased short-term food availability for scavengers from discards, offal, and dead benthic organisms
- E. Shift towards smaller organisms

Indirect...

- F. Alteration of the seafloor community structure
- G. Shift in the flow of materials and energy in the ecosystem
- H. Shift in production and balance between non-human consumers
- I. Alteration of biodiversity
- J. Increased vulnerability to other natural or anthropogenic stressors

*Status:* Phase 1

*Potential Partners:* Regional research institutions, NMFS, CDFG

### ***Activity 5.2: Identify Additional Necessary Research***

This activity recognizes that there is a need to perform further study on the impacts of trawling on benthic habitats, particularly at a local level. Conducting, supporting, and coordinating research in benthic habitats is a critical aspect of the Sanctuary's role in protecting this resource. Working group members have identified a preliminary list of research needs. This list will be augmented during the course of this plan's implementation as additional data gaps are identified.

The applicability and relative importance of the studies identified below are dependent upon the type of habitat being considered. Therefore, once the Sanctuary identifies what areas are most at risk, it will be able to determine what the research needs are for that habitat.

- A. *Promote study that addresses the recovery rates and dynamics of community structures through post-regulatory monitoring.* In order to discern the severity of trawling impacts it is necessary to examine the rate at which a trawled site recovers and the ecological dynamics of that recovery over time. Evaluating these on a local, habitat specific level can help identify the severity of impacts and the need for and design of tailored remedial action. This study would also examine the impact on the physical structure of these habitats as it relates to benthic ecology. (Phase 1)
- B. *Promote study that seeks to identify levels of habitat specific impairment.* Evaluating the quality of a particular habitat, or the level of impairment from bottom trawling will be critical to the identification of baselines. Categorizing habitats based on level of impairment and evaluating not only what species are present but also what should be present, will also be useful in prioritizing habitats for protection. (Phase I)
- C. *Characterize the different gear type deployment and impact.* Understanding the different gear type impacts on specific habitats will be critical to the development of appropriate management strategies and recommendations. Not all gear types impact benthic habitats in the same way or to the same degree. Consulting the literature and local scientists to describe these effects is an important step in both understanding the problem and identifying potential solutions. This activity would include evaluating the impact of various footrope, mesh designs, and towing speed as well as excluder devices and potential new gear developments. (Phase 2)
- D. *Promote study that addresses the effects of different gear types and gear type modifications on local community structure including mortality estimates of non-target species.* "Bottom trawling" is a general classification used to describe mobile gear that is dragged along the seabed. In reality there are many sub-classifications in this category. Adverse impacts on benthic habitats will vary with gear type. There is a need to distinguish the different effects of gear types on particular habitats. Bycatch is a serious concern with bottom trawling and will vary with gear type. A study that examines the bycatch of all types of organisms as opposed to only managed species would give the Sanctuary and managers a clearer picture of what the ecosystem impacts of bottom trawling are. This information will help the Sanctuary and managers identify impact indices and to consider effects outside of benthic habitats as well effects on the benthic community. The Sanctuary will seek to support the study of specific gear type impacts and means by which harmful effects can be mitigated through modification and deployment. (Phase 2)
- E. *Promote study that addresses the cumulative effects of repeated trawling and the potential utility of rotating closures through post-regulatory monitoring.* In order to evaluate the impacts of trawling and to assess the effectiveness of regulation at protecting and restoring the resource, there is a need to quickly establish baseline monitoring following closures. The Sanctuary could pursue a study that examines both pristine areas and those that are recovering after regulatory action was taken. Repeated trawling may have longer term effects than those caused by less frequently trawled areas. The difference in recovery dynamics would be useful information in recommending a system

of rotating or seasonal closures. This study would investigate means to employ high resolution, real time, and spatial and temporal adaptive management. It would involve exploring technologies and methods to incorporate more refined data into management and research. (Phase 2)

*Status:* Phase 1

*Potential Partners:* Regional research institutions, fishermen, NMFS, CDFG, Sea Grant.

## **Strategy BH-6: Potential Ecosystem Protection Measures**

### **Strategy Description**

After assessing the location and extent of impacts from trawling and consulting with fishermen, the Sanctuary will assess the need for recommending management measures to the relevant fishery management agency. The Sanctuary will develop any potential recommendations with an eye to facilitating use of the resource by small scale local participants.

#### ***Activity 6.1: Generate Socio-economic Profile of Local Trawl Fishery***

This activity recognizes that the fisheries within the Sanctuary are a critical component of the region's economy and culture. Fishermen are facing loss of their livelihood and the Sanctuary could make recommendations that have impacts on trawl fishery participants. A socio-economic profile of the trawl fishery needs to be created and considered in any management action or recommendation. Understanding the socio-economic characteristics of the trawl fishery and fishermen is critical to the ability to appropriately consider the economic effects of regulation and impact mitigation measures. The study would consider potential future impacts, and the spatial and temporal distribution of markets and the relative value/impact of the market vs. regulations. The Sanctuary will also work with economists and fishermen to describe the effects that recent regulatory changes such as the groundfish closure have had.

*Status:* Phase 1

*Potential Partners:* Fishermen, NMFS, UCSC, PCFFA, NMFS, CSUMB, UCSB - Bren School

#### ***Activity 6.2: Develop Criteria For Potential Ecosystem Protection Measures***

After defining the benthic habitats in need of protection the Sanctuary will consider the type of protection needed, and the expected benefits of that protection. The Sanctuary will develop criteria including, the impact of trawling on vulnerable habitats in the Sanctuary, the socio-economics of the local trawl fishery, protection afforded by existing management, and benefits of increased protection.

*Status:* Phase 1

*Potential Partners:* Regional research institutions, NMFS, PFMC, CDFG, local trawlers

#### ***Activity 6.3: Explore Regulatory Modifications with Fisherman, Other Stakeholders, and Fishery Managers***

The Sanctuary will consult with fishermen, researchers and agencies to evaluate the potential benefits, effectiveness, and costs of different management options including special marine protected areas.

*Status:* Phase 2

*Potential Partners:* Regional research institutions, NMFS, PFMC, CDFG, local trawlers

#### ***Activity 6.4: Consider Socioeconomic Impacts of Proposed Management Actions***

If and when the Sanctuary finds that it should make management recommendations to fishery management agencies on trawling issues, it will consider the impact on fishery participants and the community.

*Status:* Phase 2

*Potential Partners:* Local trawlers, CDFG, PFMC, socio-economists

***Activity 6.5: Recommend Proposed Ecosystem Protection Measures to Appropriate Agency***

Determining needs for recommended management will involve input from stakeholders and agencies. If the Sanctuary finds that more protection from the effects of bottom trawling is needed, it will consult with management agencies on development of recommendations. This strategy may also involve coordination with the Sanctuary working group addressing marine protected areas.

*Status:* Phase 2

*Potential Partners:* Regional research institutions, NMFS, PFMC, CDFG, local trawlers

***Activity 6.6: Evaluate Utility of Economic Mitigation Measures***

The Sanctuary recognizes that the trawling industry has been subject to strict regulation that has made it economically challenging for many participants. These fishermen are frequently heavily invested in the fishery and may find it difficult to find other employment. Mitigation measures such as buy-out programs, money required for gear changes, and re-education programs that are designed to ameliorate the economic condition of these fishermen are options that the Sanctuary will consider endorsing and helping to pursue.

*Status:* Phase 2

*Potential Partners:* Congressional representatives, trawlers, PFMC

## **Strategy BH-7: Education Program**

### **Strategy Description**

Education and outreach will be a critical part of this plan's success. Fishermen, managers and researchers must be able to effectively communicate and share information with one another. All three of these groups have valuable information to share with the public at large. The Sanctuary has a separate action plan for incorporating fisheries issues into research and education. Activities specifically identified for this plan will likely fit into broader strategies identified by that group, and efforts will therefore be closely coordinated. The goal of this strategy is to educate the public regarding the impacts of bottom trawling and to facilitate and encourage information exchange between managers, researchers, and fishermen.

### ***Activity 7.1: Define Educational Needs and Develop Education and Outreach Program***

MBNMS staff will conduct a needs assessment based on a determined target audience and synthesize and package the results of research, analysis and recommendations into an educational and outreach program.

*Status:* Phase 2

*Potential Partners:* Regional research institutions, NMFS, Fishermen, CDFG, PFMC, Sea Studios, Monterey Bay Aquarium, Sanctuary Education Panel.

## **Citations**

1 Engel, J., Kvitek, R. 1998. Effects of Otter Trawling on a Benthic Community in Monterey Bay National Marine Sanctuary. *Conservation Biology* 12: 1204-1214.



## **Big Sur Coastal Ecosystem Coordination Action Plan**

### **Goal Statement**

The Monterey Bay National Marine Sanctuary will lead an effort to design and facilitate a program to:

- ☐ Enhance communication between the public and agencies with jurisdiction in the Big Sur coastal region
- ☐ Improve resource agency coordination
- ☐ Provide enhanced protection and management of coastal and marine resources

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### **Introduction**

The Big Sur region is characterized as a meeting of land and ocean that is unparalleled in natural beauty with high cliffs, rugged canyons and crashing surf. This is a unique stretch of coastline and wilderness valued as international treasure and a special place for those who live there and all who visit the area. This is also a unique and special area in the Monterey Bay National Marine Sanctuary where the continental shelf hugs the coastline and several deep offshore canyons define a special component of the Sanctuary's marine ecosystem. An upwelling of deep, cold, nutrient rich waters at Pt. Sur supports a blooming of phytoplankton providing the foundation for marine life rich in marine invertebrates, kelp forests, rockfish, seabirds, sea otters, sea lions and migrating whales. Onshore, a relatively thin series of coastal watersheds drain the coastal terrain toward the ocean through steep canyons of open oak woodlands and towering redwood forests. This special region offers a unique opportunity for agency partnerships in protection and management.

Presently, there are several local, state and federal agencies producing new or revised management plans affecting the Big Sur coast. Public groups and individuals have raised a concern that all these agencies will develop separate plans for pieces of the Big Sur coastal ecosystem, rather than a single plan that identifies the related roles and interconnectedness among agencies and components of the ecosystem. MBNMS is working to identify a framework for a comprehensive, multi-agency “Big Sur Coastal Ecosystem Coordination Plan”, integrating resource protection, education and outreach, and research and monitoring activities specifically for the Big Sur area. Many of these agencies currently coordinate on several of these issues, however no formal plan or guidelines exists that offers the agencies clear guidance on existing programs, who to contact and resource collaboration opportunities.

Specific planning efforts underway or in the early stages of development include:

- ☐ Joint Management Plan Review, MBNMS (DOC/NOAA/MBNMS)
- ☐ Monterey County Periodic Review (California Coastal Commission)
- ☐ Monterey County General Plan Update (Monterey County)
- ☐ Los Padres National Forest, Forest Plan Update (USDA/LPNF)
- ☐ CalTrans’ Big Sur Coast Highway Management Plan (California Dept. of Transportation)
- ☐ California Coastal National Monument Management Plan (DOI/Bureau of Land Management)
- ☐ Point Sur State Park General Plan (California State Parks)

Multi-agency coordination of programs and projects can be difficult. At the same time, most agencies lack adequate resources to fully implement all of their mandates and expectations often exceed capabilities. Partnerships between agencies, the public and/or nonprofit groups help ease the lack of resources and extend an agency’s capabilities to meet its mandates. Along the Big Sur coast, the timing of all seven agencies updating or producing management plans enhances the ability of coordinating efforts of these agencies.

More effective coordination in the development and implementation of programs along the Big Sur coast should help the public understand agency roles and ensure more efficient management and protection of natural resources. For instance, at a watershed level, runoff, which may originate in a National Forest, may flow across or under a critical State Highway, through a State Park, and end up in a National Marine Sanctuary or a National Monument when it reaches the ocean. Similarly, a visitor driving along Highway 1 may intend to spend time in a county park and enjoy a bike ride along the coast during a weekend stay in a Big Sur inn. A scientific research cruise, organized among agencies, could benefit California State Parks, a new National Monument protecting coastal rocks and islands, a National Forest and its wildlife that depend on the ocean, and the nations’ largest marine sanctuary designated to protect the marine ecosystem of central California.

### **Agency Overview**

*National Oceanic and Atmospheric Administration / Monterey Bay National Marine Sanctuary*  
The Monterey Bay National Marine Sanctuary (MBNMS) is a federally protected marine area offshore of California's central coast. Stretching from Marin to Cambria, the MBNMS

encompasses a shoreline length of 276 miles and 5,322 square miles of ocean (3.3 million acres). Supporting one of the world's most diverse marine ecosystems, it is home to numerous mammals, seabirds, fishes, invertebrates and plants in a remarkably productive coastal environment. The MBNMS was established for the purpose of resource protection, research, education, and public use of this national treasure. The National Marine Sanctuary Program is updating the management plans for the Cordell Bank, Gulf of the Farallones and Monterey Bay Sanctuaries, which are contiguous from Bodega Bay to Cambria. This includes a review of the resource protection, education and research programs, the program's resource and staffing needs, as well as the regulatory goals and sanctuary boundaries.□

*Bureau of Land Management / California Coastal National Monument*

Designated by Presidential Proclamation on January 11, 2000, the California Coastal National Monument runs the entire length of the California coast (1,100 miles) between Oregon and Mexico, extends 12 nautical miles from the shoreline, and encompasses thousands of BLM administered islands, rocks, exposed reefs, and pinnacles above mean high tide. Cooperatively managed with other federal, state, local government, universities, and private interests, the primary purpose of the California Coastal National Monument is to protect important biological and geological values. The islands, rocks, reefs, and pinnacles provide forage and breeding grounds for significant populations of birds and sea mammals.

*US Forest Service / Los Padres National Forest*

The Los Padres National Forest encompasses approximately 1.75 million acres of central California's scenic Coast and Transverse Ranges. The forest stretches across almost 220 miles from north to south and consists of two separate land divisions. The northern division is within Monterey County and northern San Luis Obispo County and includes the beautiful Big Sur Coast and scenic interior areas. The Big Sur Coast is one of the outstanding features of Los Padres National Forest. The Forest manages, through a concessionaire, several popular recreation facilities along the coast that attract visitors year-round. Several key land acquisitions in the Big Sur Coastal Ecosystem have been accomplished in recent years making more outstanding areas available for the public's benefit and enjoyment. Land acquisitions in this area from 1992 to the present included a total of almost 9,300 acres. The Forest recently acquired the 1,226-acre Brazil Ranch in the Bixby Creek area. This property, with over two miles of coastline, was purchased through a partnership with the Trust for Public Land. The Forest is working closely with the Big Sur community and other stakeholders to craft a vision for future public enjoyment of the Brazil Ranch. The Los Padres National Forest is one of four National Forests currently revising their plans as part of the Southern California Forest Plan Revision.

*California State Parks*

The mission of the State Parks is to provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation. State Parks maintains a sizable and visible presence in the Big Sur Region. At this time, the Point Sur State Historic Park is undergoing a revision of its General Plan.

*California Department of Transportation (CalTrans)*

The California Department of Transportation is leading a collaborative planning effort among diverse stakeholders, including state, federal, and local agencies, community organizations, and elected officials, to develop a management plan for Highway 1 along the Big Sur coast. The effort will produce the Big Sur Coast Highway Management Plan, intended to establish coordinated management of the Highway 1 corridor along this widely treasured coastline. The Coast Highway Management Plan covers an area along Highway 1 from the Carmel River in Monterey County to San Carpoforo Creek in northern San Luis Obispo County.

*California Coastal Commission & Coastal Zone Management Act*

The California Coastal Commission, in cooperation with Monterey County, is conducting a periodic review of Monterey County's Local Coastal Program (LCP) during calendar year 2002 and early 2003. The California Coastal Act provides that the Commission periodically review the implementation of local coastal programs to determine whether the LCP is effectively carrying out the goals and policies of the Coastal Act. The review is focusing on implementation of the LCP and resource changes occurring in Monterey County's coastal zone since 1988, the year when the Coastal Commission certified the LCP and the County began issuing coastal development permits.

At the state level, the California Coastal Commission implements the federal Coastal Zone Management Act (CZMA) of 1972 as it applies to federal activities, development projects, permits and licenses, and support to state and local governments. Congress created a federal and state partnership for management of coastal resources in the Coastal Zone Management Act. The CZMA encourages states to develop coastal management programs, through, among other means, the federal consistency procedures of the CZMA. Upon certification of a state's coastal management program, a federal agency must conduct its activities (including federal development projects, permits and licenses, and assistance to state and local governments) in a manner consistent with the state's certified program.

NOAA's Office of Coastal Resource Management provides technical assistance to states on its various programs and on national issues as well. Examples include the Coastal Zone Enhancement Grants Program, the Coastal Nonpoint Pollution Control Program, the Coastal and Estuarine Land Conservation Program, and various coastal management policy issues, such as dredging. OCRM also awards federal matching funds to support state staff and community projects that address the broad spectrum of coastal management issues ranging from habitat conservation to port revitalization. Finally, the program also encourages states to assess and improve their management of public access to coastal areas, control of cumulative and secondary impacts, and mitigation of coastal hazards.

*Monterey County*

Monterey County's government is responsible for regulating land use in the unincorporated areas of the County. The County's principal means for accomplishing its mission is the General Plan, which prescribes the policies and guidelines for making land use decisions. The current General Plan was fully updated in 1982. The data on which it is based is now out of date and does not provide adequate information to guide policy decisions about land use, growth and development. A newly updated General Plan will provide a sound basis for making decisions about the amount

and location of future growth in the County, and its effects on roads and water resources, on the environment and the economy, and on jobs and affordable housing.

### **Implementation Overview**

Three strategies have been developed to meet the goals of the Big Sur Coastal Ecosystem Coordination Plan via implementation of three phases. First, before attempting to integrate the programs and policies of all agency management systems for the Big Sur area, MBNMS will facilitate coordination of agency actions on priority resource issues. The first strategy integrates the relevant data and mapping information for the public and provides access to all of the plans and documents for the various agencies. As this information is developed and made available and usable online, this will then form the foundation for the an online integrated management plan that integrates the plans, policies, and programs for the public agencies involved in resource management in the Big Sur area. The second strategy lays out the framework for each of the agencies and stakeholders to coordinate on producing action plans for priority issues as identified in this plan. Overlapping jurisdictions, different agency mandates and limited resources necessitate the development of a relationship bringing together multiple agencies for the common purpose of ecosystem management. The long-term goal will be one ecosystem plan, identifying all agency responsibilities and programs with identified areas of common management mandates and opportunities for coordination. This plan would live “online” at a website maintained by NOAA but controlled by the agency coordination team.

The MBNMS will facilitate this process in order to meet the goals, however, MBNMS implementation priorities will focus on the following products as they best address the mission of the Sanctuary. The following specific outcomes or products should result from this effort:

- ☐ Coordinated online access to planning documents
- ☐ Increased understanding of watershed resource protection, research, and monitoring needs
- ☐ Coordinated coastal and marine resource education programs
- ☐ Coordinated enforcement programs
- ☐ Provide forum to address resource issues among and between agencies
- ☐ Integrated management planning document

## **Strategy BSP–1: Provide Integrated Data and Information to the Public**

### **Strategy Description**

The purpose of this strategy is to provide a simple way for the public to access all of the various agencies, plans, programs, notices, documents, and contact information for the main resources agencies with jurisdiction in the Big Sur Region.

#### ***Activity 1.1: Create Multi Agency Website for Big Sur Region***

MBNMS staff will work with the multiple government agencies to provide an initial “one-stop-shop” online portal allowing access to the multiple agencies with jurisdiction, programs, policies and operations in the Big Sur region. This will be a first step towards making access easier and less confusion. The website will have an internet domain name that will be easily recognizable and intuitive such as [www.bigsur.gov](http://www.bigsur.gov) or [www.bigsur.ca.us](http://www.bigsur.ca.us); this will be determined after exploration of availability of domain names.

#### ***Activity 1.2: Provide Online Access for Planning Documents***

MBNMS staff will work with other agency staff to provide links to public agency management processes such as Draft and Final Management Plans, agency contact information, public notice information and a meeting calendar. Other suggested information includes emergency information and the public mapping and database information such as geographic information system data. This website and users manuals will be available for public access at the Big Sur Library, Big Sur Station, and the Henry Miller Library.

#### ***Activity 1.3: Develop Integrated GIS Database for Big Sur Coastal and Marine Resource Management***

The website will provide many layers of information related to resource data for the Big Sur region. MBNMS GIS staff will facilitate meetings of agencies with information related to the Big Sur area to compile one integrated GIS Database for Big Sur Coastal and Marine Resource Management. Additional layers can be added through “live” portals to the various agency servers and as information is updated by individual agencies, the integrated Big Sur Database would also be updated.

#### ***Activity 1.4: Update Website as Agencies Update Plans and Programs***

The website described in Activity 1.2 will need to be updated as plans and programs are adopted or updated. While the update of the plans will be accomplished by the individual agencies, a group of agency representatives must meet to ensure that the website is accurate and up to date. This should be accomplished through the portal system of linking to the agency website, however the quarterly meetings of stakeholders described in Strategy BSP-2 must discuss the status of the updates and “enforce” the updates as agencies take actions or make modifications to plans or programs.

#### ***Activity 1.5: Develop and Implement Process to Keep Public Informed about Website***

MBNMS staff will work with agencies to provide link on other agency websites as well as commercial or informational websites that involve the Big Sur area. MBNMS staff will work with the Big Sur Multi-Agency Advisory Council to ensure that the public is aware of updates and has the ability to comment or provide suggested modifications in order to better attain the

program goals. This could include a bulletin board or an email address to provide suggestions or public input on various issues.

## **Strategy BSP–2: Interagency Coordination Program**

### ***Activity 2.1: Ad Hoc Agency Coordination Team***

MBNMS will facilitate regular coordination sessions (proposed 4/yr.) for agency planning staff and stakeholders to address agency coordination needs and implementation progress. Agency representatives will identify technical representatives for coordination meetings to address specific priority issues. All agencies must commit to implementation of the plan and participation in the Coordination Team. Reporting of progress should be brought to the Big Sur Multi-Agency Advisory Council. Advice from the Council would be provided back to the Coordination Team.

**Staff Note:** Some working group members have suggested using a Scenic Byways Program as a vehicle to implement this activity. MBNMS Staff will continue to explore this concept with CalTrans and other members of the working group to explore viability. This is also an action item for CalTrans as part of the Coast Highway Management Plan.

### ***Activity 2.2: Priority Issue Coordination Task Forces***

MBNMS will facilitate certain agency coordination task forces charged with addressing coastal and marine resource management issues. Other agencies will likely facilitate as “lead agencies” on certain issues depending on agency mandates and responsibilities. Task forces composed of agencies, stakeholders, experts, and partners would address all priority issues by developing action plans addressing specific priority issues. Each agency with relevant programs or policies must bring their relevant sections of management plans, programs and policies to the table and work with other agencies and stakeholders to identify the coordination objectives potential overlapping programs, complimentary policies, mutual needs, and potential policy or program conflicts. Depending on the outcome of issue discussions, an agency may need to modify regulations and policies. For instance, a determination to allow offshore disposal of landslide debris (item B below) could require the MBNMS to change its regulations and BLM to adopt rules and regulations that would allow it for the California Coastal National Monument.

As an example of coordination, brief outline descriptions are included for addressing Emergency Response and Landslides Road Repair Issues. These two issues are the most urgent of the MBNMS management priorities for the Big Sur Coastal Region. Other issues would be developed in the future in a similar fashion.



A. *Emergency Response / Oil Spill / Vessel Grounding*

**Big Sur Coastal Oil Spill Response Plan**

The Big Sur coast remains one of the most exposed and vulnerable coastlines in central California for a major oil spill given the extensive vessel traffic between San Francisco and Los Angeles and the relative distance of oil spill response vessels and equipment. Adding to the risk and lack of immediate responders, many areas of the coastline are inaccessible to typical shore based clean up response equipment. In addition to the MBNMS, a major oil spill in the area would directly impact lands managed by US Forest Service, State Parks, the California Coastal National Monument, CalTrans, as well as private landowners. Strategies and activities that should be undertaken by the MBNMS to address this issue would include

- ☐ Coordinate with NOAA's Office of Response and Restoration, Coast Guard and CDFG Office of Spill Prevention and Response (OSPR) to assess current response capabilities and equipment resource gaps in the Area Contingency Plan
- ☐ Assess available research, characterization and monitoring of the intertidal and nearshore subtidal resources, and seabird and marine mammal aggregation areas to identify the most sensitive areas of the coastline
- ☐ Determine if and where immediate contingency measures planning should occur
- ☐ Determine if a specific subsection of the U.S. Coast Guard's Area Contingency Plan could be identified to allow for additional coordination with MBNMS, CalTrans and US Forest Service, California Coastal National Monument, State Parks, County OES, and local experts
- ☐ Based on above assessments, update Area Contingency Plan subsection to clearly articulate the resource protection and management responsibilities of the MBNMS and other agencies, as well as the necessary additional equipment, training, and storage locations
- ☐ Conduct a major oil spill drill involving all agencies at least once per year to ensure readiness and identify additional resource or contingency needs

*Potential Partners:* Monterey County, Cal Trans, State Parks, US Forest Service, Coastal Commission, Big Sur Volunteer Fire Department, USCG, CDFG-OSPR, CDF, CHP, Fire Departments, Pacific Valley School, BLM, USF&WS, volunteer groups (BAY NET, FES), Fishing Community (Monterey, Morro Bay, Port San Luis Harbors), NOAA OR&R, Clean Seas, Clean Bay

B. *Landslides/Road repair*

**Potential Offshore Disposal of Landslide Material**

As portions of the Big Sur coast are highly erosive, Highway 1 along the Big Sur coast is subject to landslides from above the highway that bury it, and from below the highway that under cut it. CalTrans' *Coast Highway Management Plan* (CHMP) identifies strategies for prevention and handling landslides. The CHMP identifies the need to

consider offshore disposal of excess landslide debris into the marine environment. Strategies and activities that must be undertaken by the MBNMS include:

- ☐ Conduct research, characterization and monitoring of the intertidal and nearshore subtidal resources, and seabird and marine mammal aggregation areas below the highway
- ☐ Integrate above data with GIS data layers from CalTrans and US Forest Service, California Coastal National Monument, and State Parks to map all sensitive resource areas
- ☐ With best data available, determine offshore sediment transport along Big Sur coast, including estimating natural inflows and outputs, and physical characteristics, of sediment
- ☐ With California Coastal National Monument, Coastal Commission, US Forest Service, State Parks and possibly other resource management agencies, and considering natural resource constraints, collaborate with CalTrans to develop a proposal to address CalTrans' disposal needs
- ☐ Assist CalTrans with Joint NEPA/CEQA document to evaluate proposal for offshore disposal
- ☐ Based on NEPA/CEQA review, MBNMS (and other agencies) decide on what to allow regarding offshore disposal of landslide debris

*Potential Partners:* Cal Trans, State Parks, US Forest Service, Coastal Commission, BLM/CCNM

#### *C. Research and Monitoring*

*Potential Partners:* CalTrans, State Parks, US Forest Service, BLM, CDFG, SAC Research Activities Panel, watershed groups (Garrapata), SLUGS, permit related (non-mitigated), Big Creek Reserve, land trusts

#### *D. Education, Interpretation & Outreach Programs*

*Potential Partners:* Cal Trans, State Parks, US Forest Service, Coastal Commission, BLM Big Creek Reserve, volunteer groups, Big Sur schools, Ventana Wildlife Society, Scouts, MRPD

#### *E. Enforcement and Cross Deputization*

*Potential Partners:* Monterey County Sheriff, State Parks, U.S. Forest Service, USCG, CDFG, NMFS, BLM, Big Creek Reserve

#### *F. Sensitive Habitat Protection Programs/Measures (tidepools, marine reserves, wildlife disturbance)*

*Potential Partners:* State Parks, US Forest Service, Coastal Commission, BLM, CDFG, USFWS, MoCo, Wildlife groups, (Native plant, CetSoc, FSO, FES)

*G. Aerial overflights (Private, Public, Military)*

*Potential Partners:* Monterey County Film Commission, State Parks, US Forest Service, Coastal Commission, USFWS, USCG, CDFG FAA, BLM, Pilot Assns., CAMP, airlimo, military, CHP, CalTrans, FSO/FES, Ventana Post Ranch

*H. Coastal Armoring*

*Potential Partners:* Monterey County, Cal Trans, State Parks, Coastal Commission

*I. Interagency Program Review (e.g., input/commenting on other agency's proposals)*

*Potential Partners:* Monterey County, Cal Trans, State Parks, US Forest Service, Coastal Commission, BLM, F&G, USFWS

*J. Land Use and Scenic Resource Protection*

*Potential Partners:* Monterey County, Cal Trans, State Parks, US Forest Service, Coastal Commission, Land Trusts, Big Creek Reserve, CTOA, local service groups, Carmel Highlands Association, Watershed Councils, BLM, Ventana Wilderness Society, Native Plant Society, Santa Lucia Natural History Symposium

*K. Community Character, History, and Cultural Resources*

*Potential Partners:* Monterey County, Cal Trans, State Parks, US Forest Service, Coastal Commission, Big Sur Historical Society, Point Lobos Natural History Assn., Docents, Point Sur, Big Sur Natural History Assn., Lighthouse Keepers Assn., MoCo Cultural Community, Henry Miller Library

*L. Highway 1 and Public Access Network (horizontal, vertical, waterborne):*

*Potential Partners:* Monterey County, Cal Trans, State Parks, US Forest Service, Coastal Commission, Ventana Wilderness Alliance, Sierra Club, Coast Walk, User groups (kite surfers, windsurfers, paragliders, hang gliders, dive, hike, bike, surf etc), TAMC

*M. Invasive Species Control*

*Potential Partners:* Cal Trans, State Parks, US Forest Service, Coastal Commission, California Native Plant Society, Watershed Society, Forest Service, Big Sur weed management, Monterey County Weed Management

*N. Watershed Management and Protection Programs*

*Potential Partners:* Monterey County, State Parks, US Forest Service, Coastal Commission, CDFG, USFWS, NOAA-NMFS Citizen watershed groups, land trust, water purveyors, Four Winds Council, Carmoldi Hermitage

*O. Fire Response*

*Potential Partners:* Monterey County, Cal Trans, State Parks, US Forest Service, Coastal Commission, Big Sur Volunteer Fire Department, USCG, CDFG-OSPR, CDF, CHP, Fire Departments, Pacific Valley School, BLM, USF&WS, volunteer groups (BAY NET, FES), Fishing Community (Monterey, Morro Bay, Port San Luis Harbors), NOAA OR&R, Clean Seas, Clean Bay

### **Strategy BSP-3: Integrated Comprehensive Big Sur Plan**

This third strategy would be the culmination of a single resource management plan for the entire coastal ecosystem, identifying individual agency responsibilities and programs with identified areas of common management mandates and opportunities for coordination. This plan would encompass resource management agency responsibilities from the Carmel River to San Carpofaro Creek south of Ragged Point. This plan would be the compilation of the action plans developed during implementation of Strategy BSP - 2. Multiple decision makers, mandates, and programs on varying schedules may hinder the potential for consistently updated “hard copy” plans and therefore this plan may have to live online at the website developed as part of Strategy BSP-1. Summary reports, such as informational guides or compendiums may be developed once a year.

#### ***Activity 3.1: Integrate Priority Action Plans from Strategy BSP - 2***

The Agency Coordination Team would compile the completed Action Plans from Strategy BSP-2 to form a coordinated and integrated plan identifying agency responsibilities, stakeholders, and partners in implementation of the plans to address the individual natural resource issues.

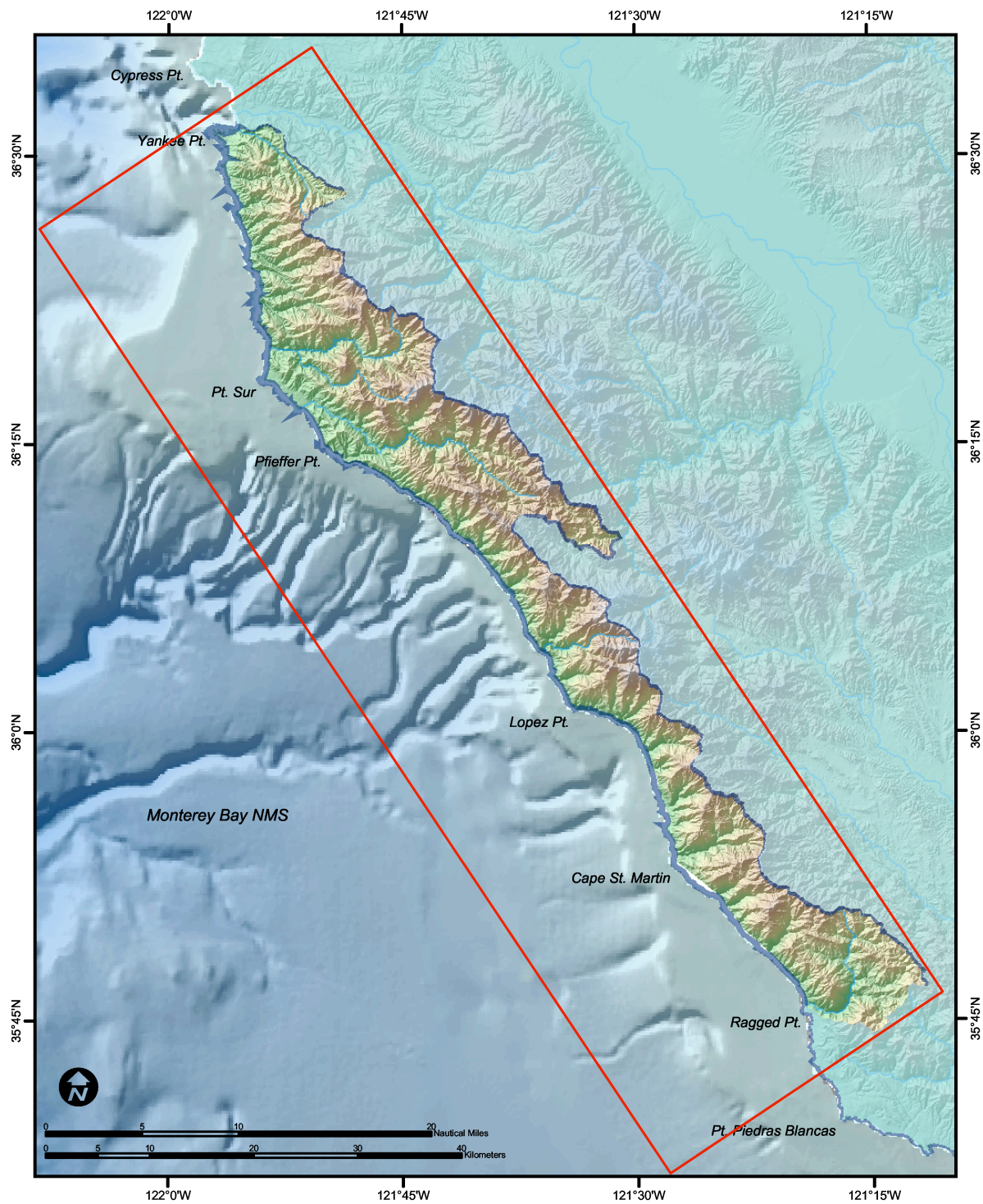
#### ***Activity 3.2: Maintain Plan with Agency Coordination Team and Task Force Representatives***

The contents of the plan are determined by the definition of the priority issues identified in Strategy BSP-2. Updates will occur to the individual action plans (and therefore the Integrated Comprehensive Plan) as agencies work with Task Force members, the Agency Coordination Team as updates occur with the various agency planning or program actions or as new priorities are identified.

#### ***Activity 3.3: Conduct Workshops to Facilitate Public Comment on Integrated Comprehensive Plan***

The Agency Coordination Team will conduct public workshops to facilitate public comment and input on the Integrated Plan and individual Action Plans as they are developed. These workshops may serve to provide input to agencies as they related to individual agency programs or policies. This input would then be provided back to decision-makers at the appropriate agencies.

**Figure BSP 1. Big Sur Coastal Ecosystem Coordination Plan Area**



## **Davidson Seamount Action Plan**

### **Goal Statement**

The goal of the Davidson Seamount JMPR Working Group was to complete an initial analysis and recommendation for potential protection of the Davidson Seamount via inclusion in the Monterey Bay National Marine Sanctuary.

### **MBNMS Staff Contact**

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### **Working Group Members**

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David Clague	Monterey Bay Aquarium Research Institute
Curtis Collins	Naval Postgraduate School
Kathy Fosmark	Commercial Fisherman/Alliance CSF
Kaitilin Gaffney	MBNMS SAC - Conservation
Randy Kochevar	Monterey Bay Aquarium
Meredith Lopuch	World Wildlife Fund
Ron Massengill	MBNMS SAC - At-Large
Tom Roff	Commercial Fisherman

### **Introduction**

The public had an opportunity to provide comments on any aspect of the MBNMS during initial phases of the Joint Management Plan Review (JMPR) process. Comments related to the Davidson Seamount included the following general categories: 1) include the Davidson Seamount into the MBNMS, 2) include all of the Central California Seamounts into the MBNMS, and 3) do not include the Davidson Seamount into the MBNMS. The task of the Davidson Seamount JMPR Working Group was to complete an initial analysis and recommendation for potential protection of the Davidson Seamount via inclusion in the Monterey Bay National Marine Sanctuary.

This report is the result of the working group efforts. Davidson Seamount met not one, but many National Marine Sanctuary Act standards for sanctuary designation. A large majority of the working group members recommended that inclusion of the Davidson Seamount into the MBNMS should move to the next step in the JMPR process (Secretary of Commerce determinations and findings, leading to a draft management plan/EIS). They felt there would be worthy protection, education and research advantages of this designation. A minority of the working group recommended that a new national initiative be developed to protect and manage collection on all U.S. seamounts, and manage sustainable extraction through a scientific peer review process. The concern of the latter group was largely that Sanctuary status would

potentially increase the likelihood of future fishing regulations, and a few members were against more regulation, in general, in the ocean environment.

## **Background**

### ***Seamount Characterization and Protection***

Seamounts have been defined as steep geologic features rising from the seafloor with a minimal elevation of 1,000 meters and with a limited extent across the summit (Menard, 1964; US Board of Geographic Names, 1981). This definition is not strictly adhered to in the literature, and steep undersea mountains are often referred to as seamounts regardless of size (Rogers, 1994).

Seamounts have a variety of shapes, but are most often conical with a circular, elliptical, or more elongate base. They are usually of volcanic origins. It has been estimated that there are more than 30,000 seamounts over 1,000 meters tall in the Pacific Ocean, approximately 800 in the Atlantic Ocean, and an indeterminate number in the Indian Ocean (Epp and Smoot, 1989; Rogers, 1994).

Biologists, geologists and oceanographers began examining seamounts over 50 years ago (Hess, 1946; Menard and Dietz, 1951). The methods of biological study over this period consist mostly of examining samples from trawls, dredges, traps, and nets (e.g., de Forges et al., 2000; Fock et al., 2002). In the last decade, there have been advances in submersible technology that now allowed direct exploration of these unique deep sea environments (e.g., Amatzia et al., 1986; NOAA Ocean Exploration, 2002). However, less than 0.1 percent of the world's seamounts have been explored for what species live on them (de Forges et al., 2000; NOAA Ocean Exploration and Research Initiative, 2000). These studies indicate that seamounts function as deep sea "islands" of localized species distributions, dominated by suspension feeders (e.g., corals) growing on rock, in an otherwise flat, low biomass, sediment-covered abyssal plain (Rex, 1983; Rogers, 1994; de Forges et al., 2000).

Seamounts create complex current patterns that can influence sea life above them (e.g., Haney et al., 1995), and concentration of commercially valuable fish species around relatively shallow seamounts is well documented (e.g., Boehlert, 1986; Gerber, 1993; Rogers 1994). Current-topography interactions on seamounts include semi-stationary eddies (Taylor columns), internal wave reflection, tidally induced currents and eddies, trapped waves, and eddies shed downstream (Brink, 1989; Boehlert and Mundy 1993). Currents over seamounts have been measured up to 48 cm per second (= 0.9 knots) (Amatzia et al., 1989). Evidence for enhanced primary productivity leading to concentrations of fish and zooplankton over seamounts is, however, sparse (Boehlert and Mundy, 1993; Rogers, 1994). Moreover, some suggest that productivity is more influenced by the physical prevention of zooplankton diurnal migrations to deep water, making them more vulnerable to predation (Zaika and Kovalev, 1985). How close the seamount summit is to the seasurface is likely an important variable that could influence water column productivity, but this has not yet been definitively addressed.

Conservation issues relative to seamounts revolve around endemism (species found on only one seamount), harvest, and low resilience of species. Wilson and Kaufman (1987), in their review of seamount biota and biogeography noted that of the 597 invertebrate species reported from 59 seamounts, 92 were novel species and many were endemic (up to 28% on the Vema Seamount). More recently, de Forges et al. (2000) found in excess of 850 species from seamounts in the



Tasman Sea and southeast Coral Sea, of which 29 – 34 % are new to science and potential seamount endemics. There are some well documented cases of fishery exploitation, including the orange roughy off the coast of Australia and New Zealand (Smith et al., 1991; Zeldis, 1993; Rogers 1994) and pelagic armorhead at the northern Hawaiian ridge (Sasaki, 1986; Rogers, 1994). Precious corals are highly valued for making jewelry and other decorative objects, significant harvest has come from seamounts, and coral beds have frequently been depleted by overfishing (Grigg, 1984, 1986). Deep sea corals have also been harvested to develop medicines. Seafans contain high concentrations of prostoglandins, used to treat heart disease and asthma; some corals contain pseudopterosins, a pain killer; and gorgonians produce antibiotics (Faulkner, 1992; Witherell and Coon, submitted). Though we know very little about the life history of many seamount species, there are clear cases of species susceptible to overharvest because they are long-lived with slow growth rates, they mature at old ages, their fecundity is low, and their successful new recruits occur only sporadically (Grigg, 1986; Boehlert and Sasaki, 1988; Mace et al., 1990; Boehlert and Mundy, 1993; and Rogers, 1994). Because of low species overlap between seamounts, de Forges et al. (2000) suggest that protection of seamount communities should be undertaken at a local scale; however, there are no seamounts protected by any National Marine Sanctuaries.

### ***Davidson Seamount***

Davidson Seamount is located 120 kilometers (75 miles) to the southwest of Monterey, due west of San Simeon, and is one of the largest known seamounts in U.S. waters. It is 42 kilometers (26 miles) long and 13.5 kilometers (8 miles) wide. From base to crest, Davidson Seamount is 2,400 meters (7546 feet) tall; yet, it is still 1,300 meters (4,265 feet) below the seasurface. Davidson Seamount has an atypical seamount shape, having a northeast-trending ridges created by a type of volcanism only recently described (Davis et al., 2002); it last erupted about 12 million years ago. This large geographic feature was the first to be characterized as a “seamount” and was named after the Coast and Geodetic Survey (forerunner to the National Ocean Service) scientist George Davidson.

The history of research at the Davidson Seamount is relatively simple; however, the research has produced dramatic results and Davidson Seamount is now one of the better studied seamounts in the world. Since first mapped in 1933, there have been ongoing NOAA charting efforts. Rock samples were dredged from the Davidson Seamount by the U.S. Geological Survey in 1978/79. In 1998, the Monterey Bay Aquarium Research Institute (MBARI) completed detailed sidescan and multibeam surveys to precisely map the shape and structure of the seamount. In 2000, MBARI lead a remotely operated vehicle (ROV) survey of the geology of Davidson Seamount, while including biological observations at the sea surface, in the midwater, and on the seamount itself. This same year, there was a Presidential announcement designating the Davidson Seamount as one of three important sites to launch a new era of U.S. undersea exploration. The Sanctuary then arranged an airplane survey with NOAA Fisheries in 2001 to begin a more detailed characterization of the region’s mammals. Finally, in 2002, the Monterey Bay National Marine Sanctuary led another ROV expedition to explore the seamount at all depths with a primary purpose of characterizing species patterns of distribution and abundance. This last cruise received perhaps unparalleled, national media attention for central California marine science; and the BBC is working with MBARI and other partners on a follow up cruise to feature Davidson Seamount’s spectacular benthic organisms to an international audience. The Naval Postgraduate

School has placed scientific instruments through the 1990's on the Davidson Seamount to measure currents between this offshore location and the coast (Add Collins student thesis citation).

Species associated with the Davidson Seamount can be divided into habitats including: the seasurface habitat (birds in flight and seasurface), the midwater habitat (0 – 1,250 meters below seasurface), the crest habitat (1,250 – 1,500 meters), the slope habitat (1,500 – 2,500 meters), and the base habitat (2,500 – 3,500 meters) (DeVogelaere et al., in prep.). The surface habitat hosts a variety of seabirds, marine mammals, and surface fishes, including albatross, shearwaters, jaegers, sperm whales, killer whales, albacore tuna, and ocean sunfish. At this time, there is no published evidence that the species composition in this habitat is different than adjacent areas without a seamount below, though in some years the Davidson Seamount may enhance albacore fishing (Tom Roff, pers. com.). The midwater habitat is patchy with marine snow, organic matter that continually rains down from the seasurface, most likely providing an important food source for deep sea animals. Swimming worms, an undescribed mollusk, and a recently described, basketball sized, red jellyfish (Matsumoto et al., 2003) have been seen above Davidson Seamount. The crest habitat is the most diverse, including large gorgonian coral (*Paragorgia* sp.) forests, vast sponge fields (many undescribed species), crabs, deep-sea fishes, shrimp, and basket stars. The slope habitat is composed of cobble and rocky areas interspersed with areas of ash and sediment. This area hosts a diverse assemblage of sessile invertebrates and rare deep-sea fishes. The halosaur (*Aldrovandia* sp.), an eel/lizard like species of fish, has never been seen in the California Current except on the MBNMS's 2002 expedition to the Davidson Seamount. The base habitat is the interface between rocky outcrops and the deep soft bottom. Species here are similar looking to their relatives in the nearshore, including sea cucumbers, urchins, anemones, and sea stars.

Human influence to the Davidson Seamount has been detected in the form of DDT in sediments near its base and trash (e.g., bottles, cans, broom, newspapers, shades, curtain) discarded from the seasurface (DeVogelaere et al., in prep). However, the area appears relatively pristine because of the abundance of large, fragile species (e.g., corals > 2.5 meters tall and vast fields of sponges) and an apparently, physically undisturbed seafloor. The top of the seamount is too deep for current fish trawling technology and fish density is very low and the species seen to date are not commercially desirable (Cailliet, pers. com.). The existing albacore tuna and swordfish/shark fisheries operate in the top 50 meters of water, thousands of meters above the seamount (NMFS, 2000; Starr et al., 2002).

### ***Working Group Product***

The task of the Davidson Seamount Jmpr Working Group was to complete an initial analysis and recommendation for potential protection of the Davidson Seamount via inclusion in the Monterey Bay National Marine Sanctuary.

### ***Stakeholders***

The working group identified different groups of people, each with their own interests relative to inclusion of the Davidson Seamount into the MBNMS. A complete list of concerns and comments by commercial fishermen is provided in Appendix 1.

*Scientists-* Scientific research is critical for understanding ecosystem function and to inform resource management. To date, research is the most common, human activity known to “use” the Seamount itself. Research at the Davidson Seamount could be enhanced through a Sanctuary research program (<http://montereybay.nos.noaa.gov/research/welcome.html>). However, research in Sanctuaries can also be limited through permit processes that consider ecosystem protection.

*Educators-* The Davidson Seamount has captivated the public through numerous media reports (including the CBS Nightly News and American Airlines in-flight news) and through a popular Ocean Exploration web site (<http://oceanexplorer.noaa.gov/explorations/02davidson/davidson.html>). A recent survey of the public, related to developing a visitor center for the MBNMS, found that one of their top interests was in “seafloor topography” (of which canyons and seamounts are dramatic examples). The BBC will be producing an internationally-distributed program on the Davidson Seamount, sparked by the recent discoveries and of the dramatic life forms and colors found there. The American Cetacean Society leads wildlife viewing trips to the Davidson Seamount.

*Fishermen-* Only two commercial fisheries currently operate in the waters above Davidson Seamount—drift gill netting for swordfish and sharks, and trolling for albacore tuna. The National Marine Fisheries Service manages these fisheries. They operate in the top 50 meters of water, far above the seamount. Recreational fishermen also access the waters above the Davidson Seamount for albacore.

*Marine conservation interests-* With increased evidence for a need in regional conservation of seamounts (see Background), marine conservation groups are interested in efforts to start protecting seamounts in US waters.

*Management agencies-* The MBNMS is interested in the Davidson Seamount as a potential important component to the marine ecosystem of central California and as a response to the public comment portion of the JMPR. Moreover, the Sanctuary program enhances resource protection, education, research, and multiple use in nationally significant areas (National Marine Sanctuaries Act- 16 U.S.C. 1431 ET. SEQ., as amended by Public Law 106-513).

#### *Existing and Potential Threats*

The working group identified potential threats to the Davidson Seamount:

##### *Bio-prospecting*

Some groups of organisms found on the Davidson Seamount have been targeted in other areas of the world for developing medicines (see Background). Discovering medicinal uses for natural products is important for enhancing human health services. This type of activity is regulated in the Florida Keys National Marine Sanctuary, and then natural products are synthesized in the laboratory for commercial use. However, some seamounts have been overexploited by this type of activity (add citation on India). There has been a preliminary bioassay of one yellow sponge from Davidson Seamount.

*Cumulative research collecting of long-live species*

Where there are limited populations of slow growing species, research collection can be detrimental. Over the last two years, there has been increased worldwide interest in studying deep sea corals (NOAA) such as the large pink, *Paragorgia*, found on the Davidson Seamount and they are often collected (**in prep; Nature**). This problem is exacerbated on seamounts where there is a high degree of endemism (see Background), and Davidson Seamount has at least several taxa that are slow growing and rare. Research is critical to understanding and managing ecosystems, so appropriate scientific collecting is often encouraged with permits.

*New or unknown forms of seafloor disturbance/New technologies to harvest from the seabed*

Harvesting from the Davidson Seamount is not a known, current commercial activity. With new discoveries of precious corals or other commercial species, in concert with more effective harvest technologies, commercial harvest at the Davidson Seamount could quickly cause severe impacts before mitigating regulations could be enacted. The concerns relative to impacts to the Davidson Seamount are largely for protecting a fragile area before it is severely impacted.

*Marine debris/dumping*

The Davidson Seamount area should be excluded from targeted dumping, while education about the site's significance could augment existing federal regulations regarding at-sea dumping.

*Does the Davidson Seamount Meet Sanctuary Designation Standards?*

Under the National Marine Sanctuaries Act (16 U.S.C. 1431 ET. SEQ., as amended by Public Law 106-513), there are standards for sanctuary designation (Sec. 303). Relative to Section 303, the working group addressed whether the Davidson Seamount: had special national significance relative to conservation, ecology, science, education, and aesthetics; had adequate existing protection measures; had public benefits if made a sanctuary; and manageability issues. The Davidson Seamount meets the criteria for Sanctuary status.

*Special National Significance*

Davidson Seamount has special national significance relative to:

CONSERVATION QUALITIES

- ☐ Vulnerability of resource to damage: long-lived species; dominated by large fragile, slow-growing organisms; long recovery time if impacted.
- ☐ Special characteristics of resource: The area is pristine; it has large microhabitats of old corals and sponges; and it has relatively high numbers of rare and unidentified benthic species.
- ☐ Threat of collection: the large yellow sponge on Davidson Seamount is already of interest to bio-prospectors; there are small "precious corals" on Davidson Seamount that are similar to some already collected in Hawaii.
- ☐ There are no other seamount habitats currently under Sanctuary status.

ECOLOGICAL QUALITIES

- ☐ Biologically special: Davidson Seamount has previously undiscovered species and species assemblages (large, adjacent, patches of corals and sponges); there is an opportunity to discover unique forms of competition (and other ecological processes)

between these patches. The high biological diversity of these assemblages is not found on other central California seamounts (i.e., Guide, Pioneer, and Gumdrops).

- Geographically special: Davidson Seamount is located in the California Current, which likely provides a larger flux of carbon (food) to the sessile organisms on the seamount surface relative to a majority of other seamounts in the Pacific.
- Physically special: Davidson Seamount is one of the largest seamounts in US waters. It, along with Guide, Gumdrops, Pioneer, and Rodriguez, is unlike typical oceanic-island volcanoes or near-ridge seamounts in that it is structurally more complex with northeast-trending ridges. It may have unique links to the nearby Partington and Monterey submarine canyons.
- Davidson Seamount is one of the largest seamounts on west coast.

#### SCIENTIFIC QUALITIES

- With high resolution mapping and 17 long/detailed ROV dives, the Davidson Seamount is one of the best described seamounts in the world.
- Rare or undescribed species (high diversity).
- Proximity to scientific research institutions makes the Davidson Seamount relatively accessible.
- Proximity to fishing fleets would facilitate cooperative research using these vessels.

#### EDUCATION QUALITIES

- Proximity to the Monterey Bay Aquarium and other education institutions would provide excellent educational opportunities (e.g., an education display on seamounts). The proximity of education and research institutions in the Monterey Bay region facilitates interdisciplinary collaborations that would enhance research and education.
- The National Marine Sanctuary Program has the best developed education programs in NOAA, providing an opportunity to educate the public about seamounts as well as cold water corals and sponges (interestingly, a recent survey of potential visitors to a planned Sanctuary visitor center indicates that one of their top interests is in seafloor topography).

#### AESTHETIC QUALITIES

- Davidson Seamount has clearly captivated the imagination of the public (see media and outreach product list from the May 2002 expedition: national news, BBC, newspaper articles, series of talks, new NOAA visitor center film, NOAA CD, NOS annual accomplishments, 140,000 hits per day web site, etc.).
- Charismatic issue: visually exciting; charismatic creatures like unique fish, large corals, and odd-looking invertebrates; aesthetic qualities of the seafloor are high relative to the rest of the Central California region.

#### HISTORICAL QUALITIES

- George Davidson is a historic figure in early charting and mapping, the Davidson Seamount was named after him.
- The Davidson Seamount was the first geologic feature described as a “seamount.”

#### *Inadequacy of Existing Protection Measures*

A determination must be made as to whether or not existing State and Federal authorities are inadequate or should be supplemented to ensure coordinated and comprehensive conservation and management of the area, including resource protection, scientific research, and public education. There are management agencies responsible for some activities that may occur at the Davidson Seamount – National Marine Fisheries Service protects marine mammals through

MMPA and regulates fisheries on the sea surface such as albacore, the Minerals Management Service would control potential oil, gas, and mineral extraction, and the U.S. Coast Guard enforces ocean dumping. However, as was the case when the MBNMS was designated in 1992, there is currently no comprehensive protection and management of organisms on the seamount or the surrounding ecosystem. Moreover, there are no coordinated education or research programs addressing Davidson Seamount issues.

#### *Manageability*

The Davidson Seamount is a distinct geographic unit, that is easily recognized (see Figure 1 for boundary options). Though deep and relatively far from shore, it is relatively accessible compared to other seamounts. There are many regional research and fishing vessels in the region that can access the water above Davidson Seamount. Moreover, one of the few institutions in the world with equipment able to dive the depths of Davidson Seamount, MBARI, is located adjacent to and a regular partner of the MBNMS. NOAA has airplanes and large research vessels that are available for use by the MBNMS to survey and monitor the Davidson Seamount.

The greatest Sanctuary opportunities for the Davidson Seamount would be about seamount education. The limited, necessary at-sea enforcement of regulations would be difficult for this offshore area; however, regulations would be followed by legitimate commercial operations. Management of the Davidson Seamount as a stand-alone Sanctuary could be expensive; however, it would be cost effective to add as a management unit to existing infrastructure of the MBNMS.

#### *Public Benefits of Sanctuary Status*

The public benefits of sanctuary status must be considered relative to impacts on income generating activities. There are currently no income generating activities that would be impacted by the designation of the Davidson Seamount as part of the Sanctuary to protect benthic habitats. However, the benefits of Sanctuary status would include: protection of an ecosystem for ongoing education and long term research; increased national awareness and public understanding of seamount systems; protection of rare, new, and fragile species; better understanding of Central California ecosystem function; more research to enhance resource management decisions, potentially using fishing vessels; potentially sustainable bio-prospecting; and continued access to a relatively pristine site for generations to come.

#### *Sanctuary Regulations That Would Address Potential Threats to the Davidson Seamount*

The working group determined that existing MBNMS regulations will protect and enhance understanding of the Davidson Seamount with two modifications: (1) because of the depth of the seamount, there is no need to have exceptions to the altering seabed regulation for anchoring vessels, aquaculture, kelp harvesting or traditional fishing operations, harbor maintenance, etc. (2) an additional regulation should be added to prohibit the removal, collection or extraction of animals or other biological material attached or within 100 meters of the Davidson Seamount, unless permitted. Exact wording of regulations has to be carefully considered, but the regulation of collection could be patterned after those of the Florida Keys National Marine Sanctuary.

Boundary Options for a Davidson Seamount MBNMS Management Unit

The working group asked MBNMS staff to draft alternative boundary configurations and briefly addressed the advantages and disadvantages of different boundary options outlined in Figure 1. In addition to the five options on the figure, there was a suggestion to limit the boundary to a 1,000 fm line around the seamount for easy commercial fishing navigation and because this area would include less swordfish fishery activities. There was also a suggestion to include a contiguous Central California, including all seamounts, to maximize Sanctuary benefits.

*Different boundary alternatives discussed by Working Group*

- ☐ Option 1: Three nautical mile area around base of Davidson Seamount
- ☐ Option 2: Circle, 15 nm radius around summit of Davidson Seamount
- ☐ Option 3: Square box, app. 25 nm per side, centered around summit of seamount
- ☐ Option 4: Irregular shape connected to existing MBNMS to protect seamount and link to adjacent coastal canyons.
- ☐ Option 5: No sanctuary designation for Davidson Seamount

*Advantages of the different boundary alternatives*

- ☐ Option 1: Focuses on the specific interests of Davidson Seamount; fishermen in the working group favored the least amount of overlap with their activities.
- ☐ Option 2: Easy to draw; includes other high relief seafloor areas
- ☐ Option 3: Easy to navigate by longitude and latitude.
- ☐ Option 4: Includes canyon systems that may transport material to the seamount, and contiguous to existing MBNMS boundaries.
- ☐ Option 5: Eliminates the fear that Sanctuaries may regulate fishing in the area in the future.

*Disadvantages of the different boundary alternatives*

- ☐ Option 1: Minimal sanctuary benefits; physically disconnected from the current MBNMS boundaries.
- ☐ Option 2: Physically disconnected from the current MBNMS boundaries.
- ☐ Option 3: Physically disconnected from the current MBNMS boundaries.
- ☐ Option 4: Work to date has not considered protection of canyon areas, there are no studies indicating these areas need protection.
- ☐ Option 5: Does not facilitate protection, conservation, education, or research of Davidson Seamount.

Information That Should Be Included in a Draft Management Plan/EIS

- ☐ Habitat suitability model for large corals and sponges (in progress)
- ☐ Find data (satellite images of SST) on Davidson Seamount effects regarding warm water “threads” on flanks
- ☐ Address the scoping comment, why we did not consider adding all central coast seamounts
- ☐ Socioeconomic analyses of designating the Davidson as part of the MBNMS
- ☐ Formal write up on different options: for each regulation- status quo (existing regulation; impact to resources, impact to users) and alternative (sanctuary action; impact to resources; impact to uses)

- ☐ Plans for the Davidson management unit: resource protection, research, education, and administration (consider priorities relative to other action plans)
- ☐ Review the MBNMS research permit process for maximum protection, facilitation of research, with minimum administration
- ☐ Also see Sec. 304 of the National Marine Sanctuaries Act

### **Summary of Working Group Findings**

Over a four-month period, the Davidson Seamount JMPR Working Group shared information, commented on versions of this action plan, and met four times. There were 13 members in this group and they had backgrounds in resource management, research, education, fishing, planning, conservation, and policy. The group summarized information on seamounts from around the world; summarized what is known about Davidson Seamount; determined stakeholders relative to Davidson Seamount; outlined existing and potential threats; determined if Davidson Seamount meets sanctuary designation standards; and discussed different boundary alternatives relative to inclusion of Davidson Seamount into the MBNMS.

This report is the result of the working group efforts. Davidson Seamount met not one, but many National Marine Sanctuary Act standards for sanctuary designation. A large majority of the working group members recommended that inclusion of the Davidson Seamount into the MBNMS should move to the next step in the JMPR process (Secretary of Commerce determinations and findings, leading to a draft management plan/EIS). They felt there would be worthy protection, education and research advantages of this designation. A minority of the working group recommended that a new national initiative be developed to protect and manage collection on all U.S. seamounts, and manage sustainable extraction through a scientific peer review process. The concern of the latter group was largely that Sanctuary status would potentially increase the likelihood of future fishing regulations that could halt or alter fishing near the seafloor for above the seamount, and a few members were against more regulation, in general, in the ocean environment.

### **Actions Requested From the SAC**

MBNMS staff requests advice from the SAC on the following items:

1. Does the SAC concur with the working group initial finding that Davidson Seamount meets Sanctuary Designation Standards?
2. Does the SAC concur with the majority view of the working group that including the Davidson Seamount into the MBNMS should move to the next step in the management plan review process (Secretary of Commerce determinations and findings, leading to a draft management plan/EIS)?
3. Does the SAC determine that the potential sanctuary regulations discussed at the working group and outlined in this action plan are generally adequate for protecting the Davidson Seamount?
4. Does the SAC determine that Davidson Seamount boundary options, briefly discussed at the working group, are reasonable for further consideration?



**Future Management Plan Strategies if Davidson Seamount is Pursued Further**

If the Davidson Seamount is considered for inclusion into the Sanctuary, the MBNMS staff will develop for the draft management plan a stand alone action plan for the Davidson Seamount including:

***Potential Action Plan Strategies for Davidson Seamount***

*Strategy 1: Characterization*

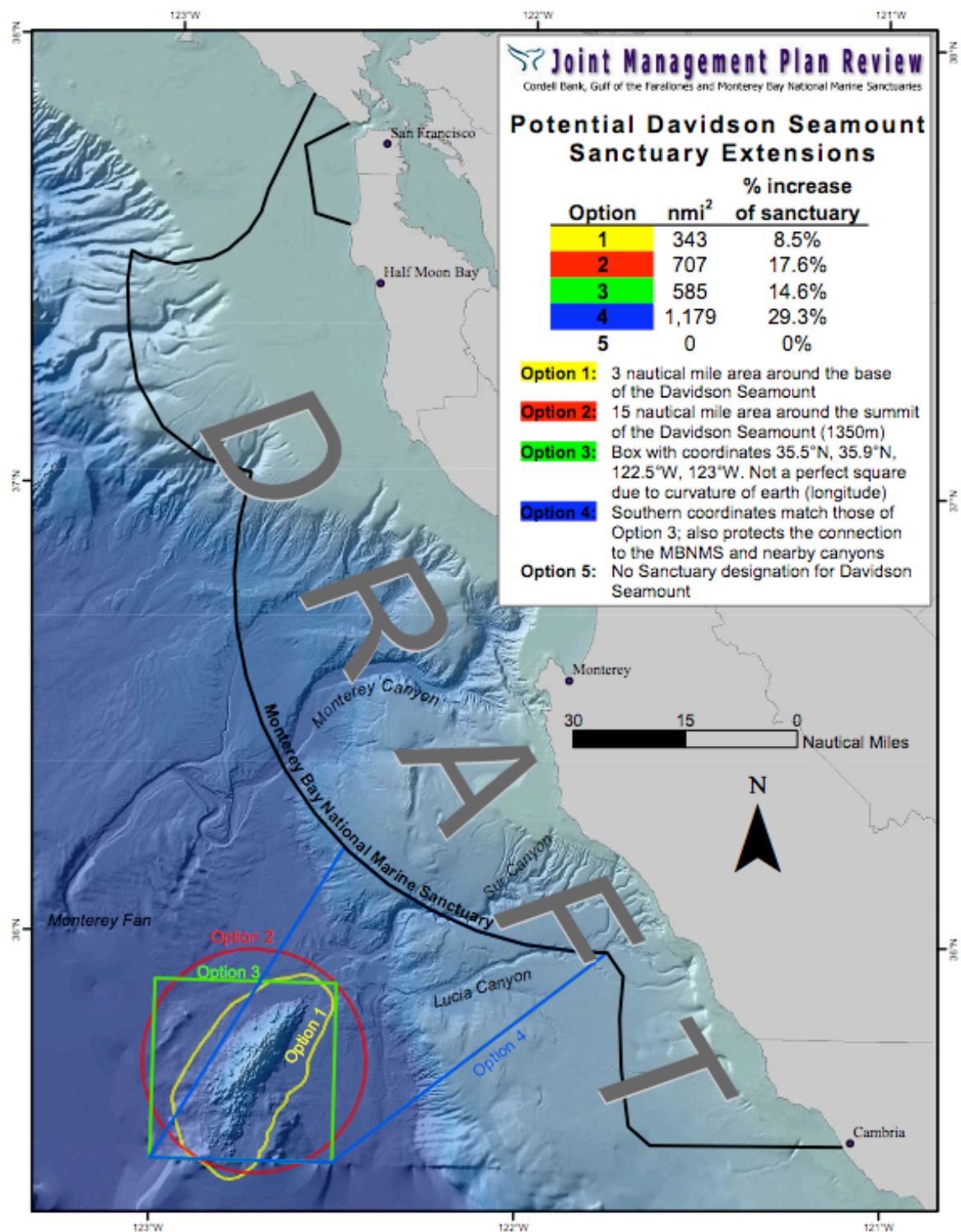
*Strategy 2: Research and Monitoring*

*Strategy 3: Resource Protection*

*Strategy 4: Education and Outreach*

*Strategy 5: Enforcement*

Figure DS 1. Potential Boundary Options



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## Emerging Issues Action Plan

### Goal Statement

Develop a system to identify, track and appropriately respond to emerging issues which are potential threats to Sanctuary resources

### MBNMS Staff Contact

Holly Price                      Resource Protection Coordinator

### Introduction

The goals and objectives set forth by the National Marine Sanctuary Act (NMSA) direct each of the sanctuaries to take an ecosystem-based approach to managing marine areas. The ecosystems include habitat structure, species assemblages and ecological processes, as well as the many interactions with humans and their activities. The Jmpr needs to develop a mechanism for long-term sustainability of these resources and processes, and to develop a system to look ahead to emerging issues that should be addressed to meet the priority goal of resource protection.

Although a wide range of issues has been included in the existing Jmpr Action Plans, many other issues are not addressed. These include issues which are currently considered to have relatively small impacts, but which may grow to have large impacts in the future, as well as issues that have arisen in other coastal areas but have not yet appeared in the MBNMS. They also include issues that are currently unforeseen but which may emerge in the future due to technological advances, changes in operations, growing population sizes, etc. This plan focuses on development of a framework to identify and address future resource protection issues.

This following constitutes a partial list of potential issues that may emerge more fully in future years. However, there are undoubtedly many other issues, either partly known or wholly unforeseen which are not listed here. Examples of potential issues that may emerge for future consideration include:

#### *1. Coastal and Offshore Energy Development*

- ☐ Wave or tidal powered energy generators
- ☐ Wind powered energy generators
- ☐ Offshore oil development – slant drilling
- ☐ Deep sea mineral development

#### *2. Commercial/Private Activities*

- ☐ Rapid ferry service between MBNMS harbors (e.g., hydrofoils)
- ☐ Increase in private airports along the coast for helicopters, fixed-wing and vertical takeoff planes
- ☐ Importation of fresh water via large floating bags from Oregon or Washington (Spragg Bags)
- ☐ Cremation remains disposal at sea via pyrotechnics
- ☐ Net pens (aquaculture) in nearshore coastal regions

*3. Recreational Activities*

- ☐ One-man submersibles and hydro-boats
- ☐ Remotely operated ski sleds
- ☐ Surf kites/parachutes and water skiing in Elkhorn Slough

*4. Military/Coast Guard/NASA Activities*

- ☐ New marine acoustic technologies
- ☐ Discharges of fuel from aircraft
- ☐ Live weapons firing/training
- ☐ Expanding military overflights/at-sea activities

*5. Research Activities*

- ☐ Impacts of Automated Underwater Vehicles on marine wildlife
- ☐ Monitoring to detect responses to climate change
- ☐ Bioengineering and potential release of organisms

*6. Coastal Development and Access*

- ☐ Human population growth issues and pressures
- ☐ Increased erosion and runoff from expanding development
- ☐ Artificial reefs to prevent coastal erosion of developments, or for other purposes
- ☐ Numerous human access sites to the coast reducing number of wild areas left
- ☐ California Coastal Trail development and expansion
- ☐ Significant expansion of elephant seal populations and human/marine mammal interactions (new conflicts between haul out sites and human access)

*7. Water Quality*

- ☐ Micro pollutants (e.g., contaminants that can't be tested for or are not tested for, like antibiotics, caffeine, sun tan lotion derivatives, etc)
- ☐ High levels of small plastic debris in the marine environment

*8. Threats From Well Beyond MBNMS Boundaries (but which affect sanctuary resources)*

- ☐ Many possibilities, e.g. a serious poaching problem in Papua New Guinea threatening small remaining population of highly migratory leatherback sea turtles

## **Strategy EI-1: Identifying and Tracking Emerging Issues**

*Activity 1.1: Drawing on existing knowledge, develop a list of potential emerging issues, building on the list provided above*

*Activity 1.2: Prioritize the list to identify those issues that currently warrant some level of additional tracking*

*Activity 1.3: Identify effective means to track those potential issues that are most likely to emerge and become priorities, without consuming too much staff time and significantly detracting from addressing existing issues in other JMPR Action Plans*

*Activity 1.4: Consider development of an “early warning” system which would assist MBNMS in receiving early information on new and unforeseen issues, including efficient pathways and processes for receiving this information*

*Status:* Phase 1

*Potential Partners:* SAC, work groups

## **Strategy EI – 2: Process to Address Emerging Issues**

***Activity 2.1: Identify and define criteria for assessing the importance of emerging issues, including consideration of***

- A. Intensity, duration and geographic extent of threat to Sanctuary resources
- B. Whether the issue falls within the Sanctuary’s mandate
- C. Rate at which the issue or threat is growing or emerging
- D. Degree of public or SAC interest in Sanctuary involvement in issue
- E. Priority ranking relative to existing JMPR Action Plans

***Activity 2.2: Outline alternative categories and processes to address emerging issues, including***

- A. Issues which are new, but are relatively small issues which staff address internally
- B. Issues which appear to be large or significant, but where we lack adequate information and need additional research to determine
- C. Issues which appear to be large or significant, but are actually relatively small, and should be addressed by an effective communication plan
- D. Large issues which are deferred due to lack of time and resources to address
- E. Large issues which are short term, and can be addressed with no formal action plan
- F. Large, complex, long-term issues with multiple interested parties which require an action plan either developed by staff or a multistakeholder working group of the SAC

*Status:* Phase 1

*Potential Partners:* SAC, work groups



### **Strategy EI-3: Emerging Issues Staffing and Operations Structure**

***Activity 3.1: Evaluate and develop staff options for tracking emerging issues, including consideration of utilizing one designated staff member, or distributing responsibility among various staff working on related issues***

***Activity 3.2: Identify process for bringing emerging issues forward to the SAC where necessary***

*Status:* Phase 1

## **Introduced Species Action Plan**

### **Goal Statement**

To maintain the natural biological communities and ecological processes in the Monterey Bay National Marine Sanctuary (MBNMS) and protect them from the potentially adverse impacts of introduced species by:

- ☐ Preventing new introduced species from establishing in the MBNMS; and
- ☐ Detecting, controlling (limiting the spread) and where feasible, eradicating environmentally harmful species that are introduced to MBNMS waters.

### **MBNMS Staff**

Steve Lonhart	SIMoN Scientist
Holly Price	Resource Protection Coordinator

### **Working Group Members**

Russell Fairey	Moss Landing Marine Lab
Mike Graham	Moss Landing Marine Lab
Kaitilin Gaffney	The Ocean Conservancy, CWG Co-chair
Jon Geller	Moss Landing Marine Lab
Vicki Nichols	Save Our Shores, CWG Co-chair
Scott Pryor	Monterey Harbor
Kerstin Wessen	Elkhorn Slough Estuarine Research Reserve
Steve Webster	Monterey Bay Aquarium
Assorted CWG	Some of the WG mtgs were held in conjunction with CWG meetings.
INVITED	
Matt Thompson	Central Coast Regional Water Quality Control Board
Representative	Santa Cruz Yacht Club
Representative	Monterey Peninsula Yacht Club
Representative	Elkhorn Yacht Club
Representative	HMB Yacht Club
Linda Horning	Moss Landing Harbor
Peter Grenell	Pillar Point Harbor
Tom Canale	SAC Fishing
Kathy Fosmark	Alliance of Communities for Sustainable Fisheries
David Ebert	SAC Business
Brian Foss	Santa Cruz Harbor
Mike Ricketts	Alliance of Communities for Sustainable Fisheries

### **Introduction**

Introduced species are a major economic and environmental threat to the living resources and habitats of the MBNMS as well as the commercial and recreational uses that depend on these resources. Once established, introduced species can be extremely difficult if not impossible to eradicate. Introduced species have become increasingly common in recent decades, and the rate

of invasions continues to accelerate at a rapid pace. Estuaries are particularly vulnerable to invasion; and large ports, such as San Francisco Bay, can support hundreds of introduced species with significant impacts to native ecosystems. Although there are numerous efforts underway at the international, federal and state level to address the issue of introduced species, the existing management plan for the Monterey Bay National Marine Sanctuary does not include any specific discussion of introduced species.

There are a variety of terms used to describe introduced species. Some of the more common terms are exotic, invasive, alien, nuisance and non-indigenous species. This action plan generally uses the term “introduced” except when citing other authorities or when specifically referring to introduced species that are known to have “invasive” characteristics (spread rapidly, out compete native species and are likely to cause environmental harm). In using the term “introduced”, this action plan refers to species that have been moved dramatically beyond their original distribution by human activities. This plan is not intended to address gradual changes in species composition precipitated by global warming.

## **Background**

### **Statutory and Regulatory Context**

#### ***Existing Federal Law Regarding Introduced Species***

The National Invasive Species Act of 1996, 16 U.S.C. §§ 4701 et seq. (NISA), which reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA), is the existing, active regulatory regime for the control of ballast discharges of aquatic invasive species. NISA contains a provision calling for voluntary ballast water exchange by vessels entering the U.S. after operating outside of the U.S. Exclusive Economic Zone (EEZ) and requires vessels to report on ballast water characteristics and vessel handling of ballast water.<sup>1</sup> A proposed revision to the 1996 Act was introduced in Congress in March 2003 (the National Aquatic Invasive Species Act of 2003). The bill would: (1) require ships entering U.S. ports to have management plans to prevent foreign organisms from getting transported in ballast tanks and require, by 2011, that all ships entering U.S. waters sanitize ballast water; (2) provide federal funding to detect invasions, identify pathways for invasion, develop prevention and control technologies and educational programs to reduce the spread of introduced species.

On February 3, 1999, President Clinton issued Invasive Species Executive Order 13112, creating the National Invasive Species Council. The Council was charged with creating a National Invasive Species Management Plan that would address all types and sources of invasive species, including aquatic invasive species in ballast water. Working with the Invasive Species Advisory Committee set up under the Executive Order, the Council completed the nation’s first Invasive Species Management Plan in January 2001. The Plan is available at [www.invasivespecies.gov](http://www.invasivespecies.gov).

The Western Regional Panel (WRP) on Aquatic Nuisance Species was formed in 1997 to coordinate management of aquatic invasive species in the Western region of North America. The WRP is comprised of western region representatives from Federal, State, and local agencies and from private environmental and commercial interests and is charged with: (1) Identifying Western Region priorities for responding to aquatic nuisance species; (2) Coordinating other aquatic nuisance species program activities in the West; and (3) Developing an emergency

response strategy for Federal, State, and local entities for stemming new invasions of aquatic nuisance species in the region (<http://answest.fws.gov/>).

### ***Existing National Marine Sanctuaries Regulation Regarding Introduced Species***

Currently, the Florida Keys National Marine Sanctuary has a prohibition on introducing exotic species.<sup>2</sup> The Channel Islands Sanctuary is proposing a prohibition in their management plan review process currently underway. Like the MBNMS, the Gulf of the Farallones Sanctuary has established an Introduced Species working group as part of the Joint Management Plan Review (JMPR) process. Both the Florida Keys and Monterey Bay sanctuaries have participated in education, monitoring and eradication efforts related to aquatic introduced species but no sanctuary has a comprehensive plan for addressing aquatic introduced species.

### ***Existing State Law in California Regarding Introduced Species***

California law (SB 1573, passed in 2002) requires the creation of an Interagency Aquatic Invasive Species Council that “shall support and coordinate the development of a comprehensive plan for dealing with aquatic invasive species in California.” This council “shall submit its first working version of the plan to the Legislature on or before January 1, 2004.”

The California Legislature passed The Ballast Water Management for Control of Nonindigenous Species (AB 703) in 1999. It became effective in January of 2000. Under the new law, ships traveling into California ports from outside U.S. waters must either: (1) exchange ballast water in deep mid-ocean waters beyond the U.S. 200-mile coastal zone; or (2) retain the ballast water on board while in California ports; or (3) discharge the ballast water to an approved onshore retention facility; or (4) treat the ballast water with an approved method that kills organisms; or (5) exchange ballast water in a zone approved by the State Lands Commission. Currently, no treatment technologies, onshore retention facilities or alternate exchange zones are approved, leaving deep-water/mid-ocean exchange or retention of ballast water as the only legal options. The Ballast Water Management Act also contained provisions regarding discharges into sanctuaries. See California Public Resource Code, §71204 (1) designed to protect sanctuaries from ballast water discharge by mandating that vessels “avoid” discharging in marine sanctuaries.

The California Department of Fish and Game (CDFG) also has numerous regulations in place designed to reduce risks from aquatic introduced species through regulations governing the sale and transportation of aquatic plants and animals, control of aquatic nuisance plants, marine aquaria pet trade, etc.<sup>3</sup> California Fish and Game Code Section 2300 specifically prohibits the sale, possession, import, transport or release of nine taxa of invasive *Caulerpa* algae.

In addition to CDFG regulations, aquatic introductions are also regulated by sections of the California Harbors and Navigation Code, California Food and Agricultural Code and the California Public Resources Code.□

### ***Regional Water Quality Control Board Requirements***

#### ***San Francisco Bay Region***

Region II prepared a TMDL report for introduced species in 2000. "Prevention of Exotic Species Introductions to the San Francisco Bay Estuary: A Total Maximum Daily Load

Report to U.S. EPA" (May 8, 2000), found at [www.swrcb.ca.gov/rwqcb2/download/Tmdl.pdf](http://www.swrcb.ca.gov/rwqcb2/download/Tmdl.pdf). The TMDL Report recommended, "zero discharge" of invasive species into Bay. Region II has taken no action to implement the TMDL Report.

#### *Central Coast*

The Central Coast Regional Water Quality Control Board (which has jurisdiction for most of the MBNMS coastline) adopted a General National Pollution Discharge Elimination System (NPDES) Permit for Aquaculture and Aquariums in September 2002. The permit contains a prohibition of discharge of introduced species and mandated monitoring requirements for introduced species.

Prohibition: "Discharge of any biota listed in California Code of Regulations Title 14, Section 245 (Aquaculture Disease Control Regulations), or referenced in Part a.8 of the same section, which is not indigenous to the Central Coast Region is prohibited. In accordance with Section 15500 et seq. of the California Fish and Game Code, enforcement of this prohibition must be requested by the California Department of Fish and Game."

Monitoring Requirement: "The Discharger shall immediately report the presence, anywhere within their facility, of any biota listed in California Code of Regulations Title 14, Section 245, or referenced in Part a.8 of the same section, which is not indigenous to the Central Coast Region (exotic species).

Any information shall be provided orally to the California Department of Fish and Game (CDFG) within 24 hours from the time the Discharger becomes aware of the circumstances. The results of all internal exotic species inspections, and inspections conducted by CDFG in accordance with Aquaculture Disease Control Regulations, shall be summarized in each quarterly monitoring report. If CDFG advises the Executive Officer that exotic species are present in the receiving water as a result of the discharge, the Discharger may be required to perform an assessment of impacts to the aquatic habitat beneficial uses of the receiving water. Such an assessment may include a complete survey of all aquatic life potentially affected by the exotic species. The assessment may require an independent third-party consultant. Any necessary eradication efforts shall be administered by the CDFG."

#### **Non-Regulatory Efforts**

Numerous councils and taskforces have been established at the federal, state, regional and local level to address the issue of introduced species. Government agencies, universities, and non-profit organizations have established databases, and developed community outreach, monitoring, research and educational programs to address this issue.

Within the Monterey Bay National Marine Sanctuary, the Elkhorn Slough National Estuarine Research Reserve, in partnership with the Elkhorn Slough Foundation and the Monterey Bay National Marine Sanctuary has already developed an early detection program for what they refer to as "aquatic alien invaders".

The “aquatic alien invaders” program focuses on two dozen species that:

- ☐ Are not yet present in the Monterey Bay area,
- ☐ Have a high potential to be transported there (especially from nearby sources such as San Francisco Bay)
- ☐ Are relatively large and easy to identify, and
- ☐ Are likely to have a significant ecological impact if they invade. See: <http://www.elkhornslough.org/invader.htm>

Each of the two dozen "least wanted" species is described in a booklet containing information on diagnostic features for identification, and information on habitat, native origin, invaded areas, and ecological concerns. The booklet also contains instructions on what to do if an invader is sighted: individuals are directed to note their exact location, collect a single voucher specimen, and immediately make an "urgent invasive alert" to the ESNERR. The ESNERR will then confirm the identification and inform the appropriate agencies (which vary by species and habitat). The target areas for this early detection program are Elkhorn Slough and Monterey Bay, central California; however, the program will accept reports from as far south as Morro Bay to as far north as Moss Beach. The ESNERR held a training workshop and provided free materials to 50 regional coastal organizations (kayaking, fishing, diving, conservation groups; harbor masters; government agencies; aquaria; universities and research organizations).

Researchers with the Sanctuary Integrated Monitoring Network (MBNMS/SIMoN) have begun working with partners to monitor for introduced species and apply for grants to address the introduced species problem. The MBNMS, Elkhorn Slough National Estuarine Research Reserve (ESNERR), California Sea grant program, and the City of Monterey are sponsoring an early detection program for aquatic introduced species, focusing on *Undaria pinnatifida* in the Monterey Harbor (City of Monterey 2003). This program involves a team of research volunteers collecting data on the locations of *Undaria* and collecting samples using SCUBA and an Aqua-Vu finder, then mapping the results. As part of this program, divers have worked to remove *Undaria* manually from harbor docks and pilings, but this eradication effort has not been successful thus far.

There are currently two scientific research proposals under review that deal with introduced species in the MBNMS. The first proposal is for a widespread monitoring program for all five National Marine Sanctuaries and five National Estuarine Research Reserves along the west coast of the United States. Submitted to the National Fish and Wildlife Foundation in December 2002, the proposal represents a collaborative effort between the Smithsonian Environmental Research Center, the National Marine Sanctuaries Program and the National Estuarine Research Reserves. The project focuses on early the detection of introduced species as well as establishing baseline data at several sites in Sanctuaries and Estuarine Reserves. The second proposal entitled “Improving detection, identification, and mapping of invasive species in the Monterey Bay National Marine Sanctuary” was submitted to NOAA in February 2003. If funded, the project will expand upon the CDFG California Invasive Species Survey (listed above) program to include harbors and marinas that were not included in the initial survey.

Additionally, the MBNMS has sponsored past research projects focusing on introduced species, including a fact sheet on *Caulerpa taxifolia* (Makowka 2000), a study on the populations of green crabs (Estelle 2000), and a study on ballast water deoxygenation to prevent introductions (Tamburri 2001). The ESNERR sponsored a research fellow to study the Japanese horn snail (*Batillaria attramentaria*), and its effects on the native California mud snail (*Cerithidea californica*) (Byers 1999, 2000a, 2000b). The ESNERR Research Coordinator, Kerstin Wasson, has also performed research on introduced species issues in the region, publishing an especially important paper on the intraregional transport of species to the Sanctuary and Slough from San Francisco Bay (Wasson et al. 2001), and participating in the study of ballast water deoxygenation (Tamburri et al. 2001).

### **Impacts To Resources**

In general, introduced species in the marine and estuarine environment alter species composition, threaten the abundance and/or diversity of native marine species (especially threatened and endangered species), interfere with the ecosystem's function and disrupt commercial and recreational activities. Introduced species may cause local extinction of native species either by preying upon them directly or by out competing them for prey. For example, the European green crab, now found in Elkhorn Slough, Tomales Bay, Bodega Bay and Bolinas Lagoon, Estero de San Antonio, and Estero de Americano, both preys on the young of valuable species (such as oysters and Dungeness crab) and competes with them for resources. Introduced species may cause changes in physical habitat structure. For example, burrows caused by the isopod *Sphaeroma quoyanum*, originally from New Zealand and Australia, are found in banks throughout the Elkhorn Slough, and may exacerbate the high rate of tidal erosion in the Slough. Introduced species pose a significant threat to the natural biological communities and ecological processes in the Monterey Bay National Marine Sanctuary and may have a particularly big impact on the Sanctuary's 26 threatened and endangered species.

Introduced species also post significant economic threats impacting industries such as water and power utilities, commercial and recreational fishing and agriculture. Examples include the zebra mussel (\$3.1 billion in nationwide costs annually, primarily to water and power plants that are trying to keep it from clogging their works), the Asian clam (\$1 billion in costs annually to utilities, the fishing industry and others), and the European green crab (\$44 million in costs annually to aquaculture, fishing and other industries). These costs will be ongoing since once established, aquatic introduced species are virtually impossible to eradicate.

□

### **Examples**

The European green crab, *Carcinus maenas*, was discovered in San Francisco Bay in 1989-90 and has since spread as far north as Washington and southern British Columbia and south to Morro Bay. It may have entered California through the discharge of ballast water from trans-oceanic ships, although spread is also possible through discard of seaweed packing material used in shipping live shellfish and the interstate transport of shellfish aquaculture products and equipment. The crab is quicker, more dexterous and can open shells in more ways than other types of crabs. In Bodega Harbor, California, records show a significant reduction in clam and native shore crab population abundance since the arrival of green crabs in 1993. Furthermore, laboratory studies show that the green crab preys on Dungeness crab of equal or smaller size.

Because they prey on Dungeness crabs and Pacific oysters, they are a serious threat to the local shellfish and aquaculture industries.

An invasive green algae dubbed “killer algae” (*Caulerpa taxifolia*) was discovered in the waters of Southern California in early 2000. Native to tropical waters, it became popular in the aquarium trade in the late 1970s and either escaped or was released into the Mediterranean Sea in the mid-1980s. It is now widespread throughout much of the northwestern Mediterranean. It appears that the algae found off Southern California is a clone of the released Mediterranean plant, and can grow in deeper and colder waters than the tropical populations. Its impacts have been compared to unrolling a carpet of Astroturf across the seabed. In areas where it has become well established, it has caused economic and ecological devastation by overgrowing and eliminating native seaweeds, seagrass reefs, and other communities. Efforts to destroy this single patch of algae in Southern California have involved tarping off the affected area and injecting chlorine under the tarp. Even with this drastic and costly effort, which killed virtually everything under the tarp, the algae is still not completely gone.

□



## Strategy IS-1: Pathways of Introduction

### Strategy Description

There are a wide variety of pathways that can lead to introductions of species within the MBNMS. The following represents a list of the most likely pathways for introduced species entering the Sanctuary.

#### **Activity 1.1: Develop Matrix to Address Pathways, Threats, and Effective Prevention/Management**

The Introduced Species Working Group recommended development of a matrix that would include each pathway listed below with an assessment of the

- ☐ Likelihood of the pathway leading to introductions
- ☐ Feasibility of the MBNMS addressing the pathway
- ☐ Severity of the threat posed by the pathway (or the species likelihood to be introduced by a particular pathway)
- ☐ The effectiveness of prevention or management efforts. The matrix might also include activities identified in Strategies 2-5 as appropriate. The matrix could be used to help the MBNMS prioritize efforts to address introduced species.

#### A. *Aquaculture*

Aquaculture has been a historic pathway for both intentional and unintentional introductions of non-native species. Cultured non-native species can escape from captivity; and other species can “hitch” along with the escapees. The Elkhorn Slough was home to repeated efforts at oyster cultivation from the turn of the 19th century to the 1970’s. Of the 56 non-native invertebrate species that have been identified in the Slough, 38 could potentially have been transported to the area with oysters. For example, the Japanese mud snail was introduced to the Elkhorn Slough and many other areas along the West coast with Asian oysters in the 1920’s and 1930’s. The Japanese mud snail is now the most abundant animal species in the Elkhorn Slough. This species can out compete native snails and is believed to have entirely displaced the native mud snail, *Cerithidea californica* (sometimes called the “California horn snail”), in Elkhorn Slough. Aquaculture operations can also result in the unintended introduction of species associated with the cultivated species. For example, the South African Sabellid worm (*Terebrasabella heterouncinata*) is a parasitic worm that infests mollusks. It was introduced into California waters in the mid-1980s with abalone imported into a California aquaculture facility. The worm spread rapidly among abalone facilities through the transfer of infested seed stock and has proved difficult to control. The worm infests only the abalone’s shell, significantly reducing abalone growth rates, causing shell deformation, reducing reproductive capacity and elevating mortality of the already-endangered abalone.

#### B. *Aquarium trade*

Wholesale importers, culture facilities and retail pet stores transport and sell non-native fresh and saltwater plants, fish and invertebrates. The release or escape of specimens into the wild by the industry and the hobbyist aquarium owner has led to introductions. For example, the aquarium strain of *Caulerpa taxifolia*, an extremely invasive seaweed that is currently infesting tens of thousands of acres in the Mediterranean Sea, was found in two

coastal water bodies in southern California in 2000. Test results indicate the *C. taxifolia* in both Huntington Harbor and Agua Hedionda are genetically identical to the aquarium strain. Releases from aquaria, either directly into the water body, or indirectly through a storm drain, are the most likely sources of both southern California infestations of *C. taxifolia*. While several species of *Caulerpa* have been banned under state law, there is little information available regarding the level of compliance with this legislation or the potential risks posed by other private aquarium species. There are numerous pet store and aquarium supply stores in communities adjacent to the MBNMS. According to one working group member, pet stores in Salinas are still carrying banned species of *Caulerpa*.

C. *Ballast Water*

Ballast water can contain aquatic plants, animals, pathogens, and other contaminants. Marine vessels take on and discharge millions of tons of ballast water daily in ports and harbors around the world. The discharge of ballast water is considered the single largest pathway for coastal aquatic introductions because of the huge volume of water carried as ballast.<sup>5</sup> Although few large vessels visit ports within the MBNMS, the Ports of San Francisco and Oakland have been subject to massive invasions of introduced species due to ballast water discharge. The San Francisco Bay's proximity to the MBNMS makes it a likely source of past and future introductions within the Sanctuary as species first introduced to San Francisco Bay through ballast water discharge can then be transported to the MBNMS through a variety of pathways.

D. *Biological control*

Selected non-native species, usually target predators, have been intentionally introduced in an effort to control the growth and spread of other introduced species. However, the specificity and selective abilities of these predators are often poorly known. For example, grass carp introduced to control unwanted aquatic plants in inland lakes resulted in native plant species being decimated.

E. *Fisheries enhancement*

U.S. federal and state agencies imported 19 game fish species into Washington State between 1890 and 1980 to enhance recreational fishing. Accidental release and unplanned spread of some species was a by-product of this activity. Private citizens may also transport and release their favorite fish or shellfish species into a body of water, hoping to establish a harvestable population. For example, the soft shell clam, *Mya arenaria*, was introduced to California from the Atlantic coast in the late 1800's. This large, edible clam was transplanted to numerous Pacific Coast sites; it was introduced to Santa Cruz, California by 1881. *Mya* was commercially harvested and sold in area markets between the 1880's and 1940's and continues to be noncommercially harvested for food and bait.

F. *Hull Fouling and other Non-Ballast Vessel Introductions*

Once introduced to a neighboring area, introduced species can spread within a region due to local boat traffic. It is likely that many of the introduced species found in Elkhorn Slough were transported via frequent boat traffic between Moss Landing and other regional harbors, such as San Francisco Bay.<sup>6</sup> Fishing vessels in MBNMS harbors can regularly travel from as far as Baja and Alaska, potentially transporting species that have been introduced in other areas along the West Coast back to the MBNMS.

Recreational boaters transport introduced species in bait buckets or boat wells, often without realizing it. Fouling of vessel hulls by encrusting organisms also provides a mechanism for transfer of species. Aquatic plants, in particular, are easily transported when plant fragments get tangled on boat propellers, trailers and fishing gear of recreational boats. Most of the introduced species found in Elkhorn Slough are associated with hull fouling and could have been transported to the Slough on boats that anchored in highly invaded areas such as San Francisco Bay.<sup>7</sup> Once a new species is introduced into one Sanctuary harbor it becomes more likely that adjacent harbors will also become invaded as the species can be transported by local boat traffic.

G. *Intentional introduction*

In some cases, non-natives species have been introduced to areas deliberately. For example, three invasive *Spartina* species were introduced into the San Francisco Bay in the 1970's as part of marsh restoration projects. *Spartina alterniflora* readily hybridizes with and out-competes the native California cord grass and threatens this native cord grass and other native plants with local extinction. All California estuaries are considered threatened by invasive *Spartina* species.

The Chinese mitten crab (*Eriocheir sinensis*) may have been introduced to the San Francisco Estuary through deliberate release to establish a fishery. Mitten crabs pose several threats to the ecosystem and local communities. Their burrowing activity accelerates the erosion of banks and levees, disturbing local habitat. In addition, the crab has disrupted needed water deliveries to estuarine habitats by clogging the pumps that deliver the water. At one point, intake screens at the Central Valley Project, which shifts water south for crops and people, were clogged with 20,000 crabs a day. The mitten crabs are projected to spread up to the largest dams in the state, and may imperil salmon populations due to their appetite for juvenile salmon. The mitten crab may also be the secondary intermediate host for the Oriental lung fluke, with mammals, including humans, as the final host.

- Larval Dispersal: Once introduced to a neighboring area, introduced species can spread within a region due to dispersal of larvae on currents.
- Live Bait: Recreational fishers buy commercially sold live worms and other aquatic organisms for use as bait. Both the bait species and its packing material (frequently invertebrate-laden seaweeds) can result in introductions through intentional and accidental release. Large quantities of Atlantic bait worms, and with them as packing material Atlantic rocky shore seaweeds (mainly *Ascophyllum nodosum*), are air-shipped weekly to sport-fishing supply stores in the Bay Area. Investigations in progress (Lau, 1995; Cohen, Lau & Carlton, in prep.) reveal that these seaweeds support large numbers of living Atlantic coast invertebrates, including mollusks, worms, crustaceans, and insects, which are routinely released into the Bay by anglers. According to Monterey Harbor staff, live bait is not sold in Monterey. It is not known how prevalent live bait use is within the Monterey Bay Sanctuary; however, live bait is frequently used in the San Francisco Bay Area. According to Cohen et al. (2001) there are approximately 8,250 boxes of marine baitworms (pileworms and blood worms) airshipped into the SF Bay area per year. Within each box (which contains approximately 6 bait worms) is over 1,100 grams of seaweed, primarily

*Ascophyllum sp.*, used as packing material. It is estimated that attached to this seaweed are more than a million invertebrates from the Atlantic Ocean including thousands of mites, amphipods and isopods, tens of thousands each of copepods, snails, mussels and polychaete worms, plus high numbers of nematode worms (Cohen et al. 2001). Lau's (1995) survey results indicated that anglers discard at least 30% of this seaweed packing into the water or the intertidal zone.<sup>8</sup>

*H. Restaurants, seafood retail seafood wholesaling and processing*

Packing materials for live seafood such as seaweed and seawater contain a number of living organisms and provide an opportunity for species introductions when the unused product, packing materials and shipping containers are disposed of improperly. Live organisms either in or on live seafood may pose an additional threat. There are numerous seafood restaurants and fish markets located on the waterfront or wharves in Sanctuary communities (especially Santa Cruz and Monterey) presenting a very direct means of potential introduction through seafood or packing material discards.

*I. Scientific research institutions, schools and public aquariums*

Private and public research laboratories, schools and aquariums use non-native species for testing, teaching, research and display. Accidental release of specimens can occur when strict protocols for animal management are not followed or when protocols do not exist. Many of these institutions rely on seawater intake and discharge systems that can provide a direct means of accidentally transporting introduced species from the lab or aquarium to the ocean. The Monterey Bay area is home to a large number of scientific research institutions, schools and public aquariums that may host non-native marine species:<sup>9</sup>

The risk of introduction posed by these institutions varies depending on the species hosted and their own protocols for addressing tank discharges and handling of other materials. For example, the Monterey Bay Aquarium has protocols and equipment in place to meet the various requirements for the discharge of aquarium seawater to the bay, and to monitor factors of human health concern in both the seawater intakes and the discharge from the aquarium. The aquarium is currently working with the Regional Water Quality Control Board to write its National Pollution Discharge Elimination System (NPDES) permit for aquaculture and aquariums. The Regional Board permitting requirements were expanded in September 2002 to include protocols for introduced species and a Best Management Practices (BMP) Plan. The aquarium's NPDES permit language should be completed in 2003. Most of the institutions listed above do not currently operate under NPDES permits with language pertaining to introduced species.

## Strategy IS-2: Introduction Prevention Program

### **Activity 2.1: Develop and Implement Introduced Species Outreach Program**

An outreach program should include components to address targeted audiences most likely to introduce species. Potential audiences should be assessed to determine the most effective way to reach them including the best message and tools to use to communicate the message.

- A. Identify appropriate target audience
- B. Assess most effective message and method of communicating message for specific target audiences
- C. Develop educational materials/programs based on IS-1 and IS-2

The Working Group offered the following recommendations in terms of potential target audiences and methods to reach them:

#### *A. Boaters*

- ☐ Consider boat shows as potential outreach opportunities, attend/distribute information at industry meetings.
- ☐ Explore using volunteers to inform boaters about risks of introduced species and methods of preventing introductions.
- ☐ Use boating newsletters to inform boaters.
- ☐ Provide information regarding introduced species with CA fishing license materials (both commercial and recreational).
- ☐ Provide information regarding introduced species prevention with boat license and cruising permit required by immigration agency.
- ☐ Target outreach at harbors to transient boaters.
- ☐ Outreach to adjacent non-Sanctuary harbors.

*Potential Partners:* trade associations, industry groups, manufacturers (West Marine, etc.), Save Our Shores Dockwalkers, harbors, other volunteer groups, yacht clubs, harbors, chandleries, CDFG, Border Patrol, harbors, Sea Grant MBNMS and non-MBNMS harbors

#### *B. Pet Stores, Bait shops, etc.*

- ☐ Provide counter placards for shops distributing live bait and aquarium plants.
- ☐ Link bait retailer to outreach.
- ☐ Attend trade shows or host workshops for pet stores; bait stores, etc. to allow in person outreach with these industries.

*Potential Partners:* pet shops, industry groups, bait shops, bait wholesalers

#### *C. Outreach to Restaurants, Fish wholesalers and Retailers*

- ☐ Include information on introduced species in Urban Watch program (include information on seafood and packing materials in current outreach to waterfront restaurants).
- ☐ Produce a restaurant flyer or poster.

*Potential Partners:* cities, restaurants

**D. Aquarium/Scientific Institutions**

- ☐ Host workshop/Seminar for academic institutions with marine labs/aquariums, to share BMPs
- ☐ Prepare and distribute prevention materials.
- ☐ Focus on issue at RAP meeting periodically.

*Potential Partners:* scientific institutions, RWQCB

**E. Aquaculturists**

- ☐ Host workshop/Seminar for academic institutions with marine labs/aquariums, etc. to share BMPs.
- ☐ Prepare and distribute prevention materials.

*Potential Partners:* scientific institutions, RWQCB

**F. Outreach to Consumers and General Public**

- ☐ Include information on introduced species in Seafood Watch.
- ☐ Encourage Monterey Bay Aquarium to develop exhibit regarding introduced species, Aquarium BMPs and what the public can do to help prevent introductions.

**Activity 2.2: Identify Incentives to Reduce Risk of Introduction**

*Ideas from Working Group*

- A. Provide financial incentives for hull cleaning, such as free coupons, reduced price at yard.
- B. Help find funding for sewerage boat yards, installing filters.
- C. Develop PR program to acknowledge businesses taking prevention steps.

*Potential Partners:* CA Dept. of Boating and Waterways, Sea Grant, cities, harbors

**Activity 2.3: Develop Necessary Infrastructure/Training**

*Ideas from Working Group:*

- A. Investigate whether areas where hull cleaning occurs drain directly to Bay, and whether the likelihood of introductions could be reduced by having wash down areas for boats and boatyards that drain to sewer systems.
- B. Provide technical training for boat yards, underwater hull cleaners, aquaculture operations.

*Potential Partners:* Sea Grant, harbors

***Activity 2.4: Regulations/Permits/Enforcement***

- A. Support state and federal efforts to address introductions (submit comments letters, testify at hearings, participate in interagency taskforce, council, etc.).
- B. Evaluate existing regulations (state and federal) to determine adequacy of existing regulatory scheme as well as level of enforcement. Assess value of additional regulations regarding introduced species (such as those of FKNMS); coordinate this effort with GFNMS.
- C. Continue to review and comment on NPDES permits. Work with Regional Boards to insure all dischargers adequately address introduced species prevention.
- D. Prohibit aquaculture operations using non-native species or native species with substantial genetic differences from local organisms of the same species.
- E. Consider recommending that State require proof of haul out and hull cleaning with renewal of license.

## **Strategy IS – 3: Baseline Information, Research & Monitoring Program**

### **Strategy Description**

Over the past five years, studies have been done in an attempt to determine the extent of introductions that have already occurred in the MBNMS. To date, these studies have focused largely on Elkhorn Slough (which is part of the MBNMS) and to a lesser degree, harbors adjacent to the MBNMS. The most comprehensive baseline study done within the MBNMS was a literature review and fieldwork performed in 1998 to assess macroinvertebrate fauna of Elkhorn Slough. This study identified 56 known exotic species in the Slough after a relatively modest search effort, suggesting that additional species that were not identified during the study may be present in the Slough.<sup>10</sup> Additional, though even less comprehensive baseline studies were done in Elkhorn Slough and Monterey harbor as part of the California Invasive Species Survey conducted under California's Ballast Water Management Act of 1999. The bill required CDFG to conduct appropriate studies necessary to develop a list of non-indigenous aquatic species occurring in the marine and estuarine waters of the state. This effort involved field and literature studies of selected harbors and estuaries<sup>11</sup>, primarily focusing on epifaunal communities, with minor investigations of infaunal, plankton, and fish communities. A report on this study will be released in 2003 and efforts are being made to expand the study to the outer coast, leading to a more comprehensive survey. Only two sites within the MBNMS sites were included in the study, Elkhorn Slough, where 27 introduced species were identified and Monterey harbor where 20 introduced species were identified.

Given the limited amount of research that has gone into the issue of introduced species within the MBNMS, the Sanctuary can play a significant role in this area.

### ***Activity 3.1: Increase Baseline Research***

MBNMS staff and partners can assist with additional baseline research especially expansion of surveys to uninvestigated areas such as Santa Cruz and Pillar Point harbors and the outer coast, and uninvestigated habitats such as pilings.

*Potential Partners:* CDFG, Marine Pollution Control Studies Lab, OSPR, harbors, ESNERR labs, academic institutions

### ***Activity 3.2: Monitor for New Invasions***

*Potential Partners:* CDFG, Marine Pollution Control Studies Lab, OSPR, harbors, ESNERR labs, academic institutions

### ***Activity 3.3: Synthesize Research Results and Make Results Publicly Available***

*Potential Partners:* RAP



***Activity 3.4: Conduct or Commission Research Related to Applied Management Strategies such as Evaluating the Feasibility and Effectiveness of Management Measures***

***Activity 3.5: Conduct Research to Assist in Prioritizing Threats (by pathway and/or taxa)***

***Activity 3.6: Assess Ecological and Economic Impacts of Invasions***

***Activity 3.7: Ensure Results of Research and Monitoring to Improve Action Under Strategy IS-1 (Pathways) and IS-2 (Prevention)***

## Strategy IS-4: Detection and Response Plan

### Strategy Description

Introduced species can become established very quickly and once established are costly and difficult, if not impossible, to eradicate. It is therefore important to be able to quickly assess the threat posed by a newly introduced or newly identified species and have a response plan with protocols in place. Ideally, resource protection agencies would be able to quickly identify a newly introduced species and respond with effective eradication efforts right away. However, such a scenario is not always realistic, therefore an introduced species response plan should include components for addressing both emergency situations and methods of managing introduced species that have already become established.

### ***Activity 4.1: Develop and Conduct an Early Detection Training Program***

The MBNMS should work with the ESNERR to continue and expanded the Early Detection program and develop enhanced detection capabilities (such as training dive volunteers). Area researchers and others who spend a significant amount of time in and under the water should be targeted for detection training. Consider value of 1-800 number like Cal-Tip for reporting detections (this may be something to support at the State level).

### ***Activity 4.2: Develop Appropriate Response Plan***

- A. The MBNMS should coordinate an effort to assess species already introduced to Sanctuary waters (or the harbors) in regards to the feasibility and efficacy of eradication efforts or other management measures designed to limit their spread. A good example is the ongoing efforts, led by MBNMS, regarding *Undaria*.
- B. The MBNMS should work with appropriate partner agencies to develop a decision making framework to help guide response to detection of an introduced species. Important components of such a framework include:

- ☐ Determining jurisdictions, authority, leadership, and organization
- ☐ Identifying funding and resources
- ☐ Developing a containment response and enforcement plan
- ☐ Assessing environmental regulatory compliance needs
- ☐ Developing a public awareness and education; outreach to decision makers as well as to affected property owners and parties
- ☐ Performing delimitation survey and mapping
- ☐ Reviewing of biology and controls
- ☐ Selecting appropriate control method

*Potential Partners:* ESNERR labs, divers, harbors, boaters

### ***Activity 4.3: Implement Response Plan***

- A. Implementation of eradication or other management methods
- B. Assessments of treatments and modification if necessary
- C. Environmental monitoring
- D. Restoration/mitigation

## **Strategy IS-5: Resource Assessment**

### ***Activity 5.1: Identify Funding Sources and Other Resources***

MBNMS staff will develop, maintain and distribute resource list for MBNMS and partners, include educational materials, funding sources for research, education and management efforts such as funding provided under State and Federal legislation. See attachment entitled “General Aquatic Invasive Species Outreach and Educational Resources” for listing of currently available materials.

#### *Potential sources of funding identified by Working Group*

- A. California Exotic Species Control Fund established under AB703, section 71215 of the Public Resources Code.
- B. AB120 Wyland would appropriate \$1,100,000 from bond funds made available by the initiative measure to the State Water Resources Control Board for the purposes of making a grant, subject to a certain determination by the state board, to the Southern California Caulerpa Action Team to eradicate *Caulerpa taxifolia*. This bill was introduced January 2003.
- C. SB 925 would establish a subsection of the California Exotic Species Control Fund for non-ballast water control efforts.

## **Citations**

1 Interim regulations implementing NISA were issued by the Coast Guard in May 1999 (64 Fed. Reg. 26672, May 17, 1999), and became final and effective July 1, 1999.

2 The FKNMS regulations use the term “exotic species” and define it as “a species of plant, invertebrate, fish, amphibian, reptile or mammal whose natural zoogeographic range would not have included the waters of the Atlantic Ocean, Caribbean, or Gulf of Mexico without passive or active introduction to such area through anthropogenic means.” Sec. 922.163 (a) (7) of the National Marine Sanctuary regulations pertaining to the FKNMS prohibits “Introducing or releasing an exotic species of plant, invertebrate, fish, amphibian, or mammals into the Sanctuary.”

3 See for example, Fish and Game Code §§ 2271, 6303, 6400, 15200.

4 Many of these species are also associated with other pathways of introduction. K.Wasson et al. Biological invasions of estuaries without international shipping: the importance of intraregional transport. *Biological Conservation* 102 (2001) at 148.

5 Carlton, J. T. 2001. Introduced Species in U.S. Coastal Waters: Environmental Impacts and Management Priorities. Pew Oceans Commission, Arlington, Virginia. Brautigam, L.A. 2001. Control of Aquatic Nuisance Species Introductions Via Ballast Water in the United States: Is the Exemption of Ballast Water Discharges From Clean Water Act Regulation a Valid Exercise of Authority By the Environmental Protection Agency? *Marine Law Institute, University of Maine School of Law. Ocean and Coastal Law Journal*, Vol.6, 33. Lexis Nexis Academic Universe-Document.

6 Of the 56 non-native invertebrate species found in Elkhorn Slough, 51 are also found in SF Bay.

7 K.Wasson et al. Biological invasions of estuaries without international shipping: the importance of intraregional transport. *Biological Conservation* 102 (2001) at 149.

8 Cohen. A.N., Weinstien. A., Emmet M.A., Lau W., and Carlton J.T. Investigations into the Introduction of Non-indigenous Marine Organisms via the Cross-Continental Trade in Marine Baitworms. A report for the U.S. Fish and Wildlife Service San Francisco Bay Program. June 2001. 30pp.

9 Monterey Bay Aquarium, Moss Landing Marine Laboratories Long Marine Laboratory, UCSC; Seymour Marine Discovery Center; Naval Postgraduate School; Monterey Bay Aquarium Research Institute; California State University, Monterey Bay; Marine Advanced Technology and Education Center, Monterey Peninsula College; Naval Research Laboratory; Hopkins Marine Station, Stanford University; Marine Wildlife Veterinary Care and Research Center, California Department of Fish and Game.

10 Wasson, K., C.J. Zabin, L. Bedinger, M.C. Diaz, J.S. Pearse. 2001. Biological invasions of estuaries without international shipping: the importance of intraregional transport. *Biological Conservation*, 102:143-153.

11 The "California Invasive Species Survey" included the major ports of San Diego, Los Angeles/Long Beach, Hueneme, Stockton, Sacramento; San Francisco Bay and adjacent waters; Humboldt Bay; and a number of secondary sites, small harbors along the length of the California coast.

## Krill Harvesting Action Plan

### Goal Statement

To protect the marine ecosystem of the Monterey Bay National Marine Sanctuary by identifying and pursuing a strategy that will lead to a permanent ban on krill harvesting within Sanctuary waters.

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### Introduction

The MBNMS is mandated to approach resource protection from a broad, ecosystem based perspective and has been funding research regarding the role that krill play in the region's marine ecosystem. Krill are a critical component of the marine ecosystem and fundamental to the trophic structure of the marine life within the Sanctuary. The two principal species of krill that exist within the MBNMS and throughout the California current are *Euphausia pacifica* and *Thysanoessa spinifera*. These species are preyed upon by almost all commercially important species within Sanctuary waters including salmon, rockfish, squid, sardine, mackerel and flatfish. Blue whales, humpbacks, and numerous seabirds including sooty shearwaters, marbled murrelets, and common murre are dependent on krill as forage. Reliable regional estimates of biomass and prey requirements do not exist. However, it has been estimated that krill makes up between 15 and 60 percent of the diet of commercially significant fish in ecosystems with comparable trophic structures.

Krill are currently not harvested within the Sanctuary, however the potential exists for this fishery to develop in the future due to an increasing need for aquaculture feed. A krill fishery could not only severely impact the integrity of the marine ecosystem but could adversely affect commercial and recreational fisheries of all kinds as most target species are directly or indirectly dependent on the resource. It could also severely harm whale watching enterprises operating within the Sanctuary. To address this issue, MBNMS will explore the potential for the future harvest of krill, outline the current regulatory framework, and recommend permanent restrictions in the Sanctuary.

### **Current State and Federal Management**

In 2000, California became the first state to ban fishing for krill in state waters. The bill was introduced by Assemblywoman Virginia Strom-Martin, and was aimed at “protecting the marine food web by stopping any krill fishery before it could be started in the state.” The Strom-Martin bill was requested by the Pacific Coast Federation of Fishermen's Associations (PCFFA) and conservation groups after a krill fishery was established off British Columbia. A commercial harvest of krill off the Canadian east coast has been implicated in the poor recovery of cod in the region; the British Columbia krill fishery is the first off the Pacific coast. PCFFA and others were concerned that “fishing for this essential link in the food chain would prevent the recovery of highly valuable and threatened commercial fish.” This bill prohibits the taking of krill of the genus *Thysanoessa* or the genus *Euphausia* for commercial purposes from state waters or the landing of krill at any state port until January 1, 2011. The bill would further provide that after January 1, 2011, this commercial taking or landing is prohibited unless permitted under regulations adopted by the commission. Another bill is currently under consideration by the California legislature that would remove this sunset clause and, in the absence of federal regulation, would prohibit California citizens or licensed vessels from taking krill in federal waters. There has been no federal action considered prohibiting or limiting krill fishing in federal waters by the regional councils, the National Marine Fisheries Service (NMFS), or Congress.

### **Description of Potential Fishery in MBNMS**

The largest current market for krill on the west coast exists in Oregon and Washington where salmon farms use krill meat to give farm raised fish their pinkish color. Most of the supply comes from the British Columbia fishery, however the highly productive waters of the Sanctuary hold dense concentrations of krill and would likely be exploited if a fishery were to begin in U.S. waters. In addition, in the Southern Ocean, krill are harvested for reduction purposes (to make fertilizer) and to produce feed for other aquaculture operations like shrimp farming and chicken feed. The factory trawlers operating in the Southern Ocean have harvested krill at a rate as high as thirty five tons of krill in eight minutes.

A krill fishery within the MBNMS would likely correspond to peak krill abundance and aggregation, which occurs in summer and early fall. Any of the trawling vessels at the ports associated with the Sanctuary could participate, and as other fisheries are closed down there will be an increasing number of vessels searching for viable alternatives. However, there are several key limitations that may serve to effectively exclude most local fishermen from any emerging krill fishery. Perhaps most significantly the Strom-Martin bill not only prohibits the taking of krill from state waters but it also makes landing krill in any state port illegal. Therefore, a krill fishery on the central coast could consist of large factory trawlers or smaller vessels dumping catches into aquaculture facilities. To stay consistent with the state law, they would need to harvest krill locally but land them in ports in Oregon or Washington.

### ***The Antarctic Example***

While the overall take of Antarctic krill is relatively low compared to its abundance, concerns have been raised over fishing's regional effects. The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has instituted an ecosystem monitoring program to detect and record significant changes in critical components of the ecosystem. It has been assumed that it is possible to assess the effects of fishing on krill availability through some index

of predator performance. Predator data has therefore been incorporated into the management scheme. Accordingly, a system to regularly record selected life history parameters of key seabird and seal populations has been in place since 1986. Despite calculations of krill yield that take into account krill and predator requirements, CCAMLR has been aware of the potential for local competition between predators and the krill fishery. On a global or regional scale fishing mortality might remain within the limits set by management and so provide sufficient escapement for predator needs. However, on a local level mortality may be much greater and escapement too low to support predators with restricted foraging ranges, or may cause a shift in the behavior and distribution of more widely ranging species. This concern is exacerbated by the timing of the krill fishery during months where many species of breeding bird and seal predators are dependent on the resource.

It has been reported that in South Georgia, in the Southern Ocean, seals, penguins and albatrosses are having difficulty in rearing offspring successfully as demand for krill has begun to exceed supply in some areas. Twenty years of long-term monitoring of seabirds and seals on South Georgia has revealed an increase in the frequency of years when there is insufficient krill to feed seal pups and seabird chicks. The animals did well in the 1980s while stocks of krill were abundant but demand began to exceed local supply in the 1990s. The extent to which these changes result from a decrease in the amount of krill or an increase in predator demand is uncertain. However, the similarity between the supply and demand is a new discovery and throws into question the perceived super-abundance of krill over all of the Southern Ocean. Seals and seabirds now consume such a large proportion of the krill population at South Georgia that they amplify the effects of gradual, underlying environmental changes. The discovery provides a new insight into the status of krill at South Georgia and highlights a vital need to re-examine the scales at which krill stocks are managed through CCAMLR.

### **Issues of Concern for MBNMS**

The oceanographic and bathymetric features of the MBNMS make it susceptible to the adverse effects of krill fishing. The Monterey submarine canyon, and portions of the Carmel Canyon provide krill with a distinctive habitat that contributes to their abundance and degree of aggregation. This makes the waters within the Sanctuary a critical feeding ground for countless forms of wildlife. These include predators like the blue whale, dense concentrations of seabirds, and commercially important fish species such as salmon and rockfish. The canyon habitat provides opportunity for high nighttime surface feeding due to its location downstream from an upwelling center, a refuge from daytime predation as krill can migrate to depths in excess of 100m in the canyon, and reduced swimming energy output during daytime schooling at depth due to reduced canyon slope currents. The Sanctuary also contains several productive upwelling centers that generate high levels of primary production leading to dense aggregations of krill.

Thus the Sanctuary's concerns about a krill fishery can be summarized as follows.

- Wildlife viewing in general and whale watching in particular are critical components of the local tourism industry. A krill fishery would coincide with the times of peak whale abundance, competing with the whales for forage and with species of seabird that are seasonally reliant on the resource.

- Bycatch is also a concern in that even though krill swarms are densely aggregated, a very fine mesh net is used which would indiscriminately catch larger predators.
- A krill fishery could adversely impact commercial and recreational fisheries of all kinds as all target species are directly or indirectly dependent on the resource. In fact, seven out of ten of the most commercially significant stocks in the region are dependent on krill as forage (Market squid diet composition consists of almost 97% krill and Pacific Hake 98% krill).
- In addition, many rebuilding groundfish stocks are reliant on the resource. (Boccacio diet composition consists of 21-50% krill, widow rockfish 21-50%, and yellowtail rockfish over 50%)

### **Statutory and Regulatory Context for Prohibiting Krill Harvesting**

The National Marine Sanctuary Act focuses on protection of the ecosystem as a whole, a field in which the Sanctuary Program has 30 years experience. The National Marine Sanctuary Program and the Monterey Bay National Marine Sanctuary recognize that the primary regulatory authority over fisheries management resides with NMFS and PFMC, and as an initial step on any fishing related matter will encourage these agencies to take the necessary measures. The original Designation Document and Final EIS for the MBNMS state that existing fisheries are not being regulated as part of the initial MBNMS regulatory regime. However, the Final EIS also states that if MBNMS regulatory exemptions for fishing threaten Sanctuary resources, NOAA could undertake rule changes consistent with Federal procedures. If it is determined that additional ecosystem protection regulations that impact fishing need to be implemented, the Sanctuary would consult with the Pacific Fishery Management Council (PFMC), NMFS, the California Department of Fish and Game (if applicable), affected fishermen and related parties, and the public. When appropriate, the Sanctuary may request that the relevant fishery management agency address MBNMS concerns within that agency's own statutory and regulatory context. In situations where the legal framework of that agency, such as PFMC, preclude it from adequately addressing Sanctuary objectives, then pursuant to subsection 304(a)(5) of the NMSA, the PFMC would be given the opportunity to prepare draft Sanctuary fishing regulations for the portion of the Sanctuary within federal waters. Pursuing the restriction of krill harvesting is therefore a legitimate means for the Sanctuary to both meet its mandate, and a valuable opportunity to provide its ecosystem based perspective to fisheries management.

### **Components of the Action Plan**

This working group identified strategies that result in a permanent ban on harvesting krill anywhere within the Sanctuary. The strategies are slightly different for state and federal waters. In the federal context, the initial phase will focus on communicating with fishery management agencies and identifying issues and concerns that both the Sanctuary and the agencies have. The Sanctuary will concurrently create an ecological report that includes an overview of the importance of krill to the marine ecosystem within the MBNMS and an assessment of the potential ecological and economic impacts of a krill fishery. The next phase would involve approaching NMFS, PFMC and the state legislature with this information, with the objective of having these entities enact a permanent ban on krill harvesting. With the cooperation of these agencies the necessary NEPA analysis would be performed and the regulation will be promulgated and enforced. In the state context, the Sanctuary would identify partners interested in requesting state legislators make the current temporary state prohibition a permanent one.



## **Strategy KH-1: Fishery Management Agency Coordination**

### **Strategy Description**

This strategy seeks to engage the Pacific Fisheries Management Council (Council) and the National Marine Fisheries Service (NMFS) in a preliminary discussion regarding the issue of krill harvesting and to establish a protocol for future interactions. It would include identifying concerns that they might have, how they might address the issue, and what type of information they would require. Involving the federal fishery management agencies at an early stage of the process will apprise them of the Sanctuary's concerns regarding krill harvesting and will serve to ensure that the Sanctuary is proceeding in a way that coincides with the needs and concerns of these agencies.

#### ***Activity 1.1: Initiate Contact with Federal Fishery Management Agencies***

Staff and working group members will approach staff from the NMFS regulatory branch, Council staff, and Council members to discuss what thoughts and concerns these entities have regarding the issue and how best to proceed with initiating a ban on krill harvesting. This activity will include a preliminary presentation to the Council.

*Status:* Phase 1

*Potential Partners:* NMFS, PFMC

#### ***Activity 1.2: Document Statutory, Regulatory, Ecological, and Economic Rationale for Seeking Cooperative Action to Prohibit Krill Harvesting***

With input from working group members, the Sanctuary will create a document that describes the role krill play in the trophic structure of the marine ecosystem. The document will also describe the characteristics, potential impacts, and reasons for prohibiting a krill fishery within the Monterey Bay National Marine Sanctuary.

*Status:* Phase 1

*Potential Partners:* World Wildlife Fund, Save Our Shores, NMFS, UCSC, Point Reyes Bird Observatory

#### ***Activity 1.3: Present Sanctuary Request to Pacific Fishery Management Council***

MBNMS staff will formally present the Sanctuary's request and supporting documentation at a future PFMC meeting regarding recommended actions related to potential krill harvesting within the Sanctuary.

*Status:* Phase 1

*Potential Partners:* NMFS

## **Strategy KH-2: Federal Waters Krill Harvesting Regulation**

### **Strategy Description**

This strategy will be pursued after the Council and NMFS have had an opportunity to identify their position on this issue. The strategy assumes a ban on potential krill harvesting will be recommended. The respective roles of the Sanctuary, NMFS, and the Council will to some extent be determined by the inclination and ability of the fishery management agencies to allocate staff time to the issue. The activities associated with this strategy account for this variable.

### ***Activity 2.1: Assist PFMC in Drafting Regulatory Proposal***

The degree of action that NMFS and the Council agree to take on the issue of krill harvesting and the amount of staff time they are willing to allocate will influence the role that the Sanctuary will play in this regard. The Council and NMFS will be given the opportunity to draft the regulations themselves, however, they may request that the Sanctuary assist in this capacity. Regardless of which entity drafts the regulatory language, the Sanctuary will be responsible for fulfilling the NEPA requirements. This will involve considering a range of alternatives including a no-action alternative. The Sanctuary will also hold a notice and comment period and provide opportunity for a hearing as required by the Administrative Procedure Act. Once this activity is completed, NMFS will publish the regulation in the federal register and the prohibition will be enforceable.

*Status:* Phase 1

*Potential Partners:* NMFS, PFMC,

### ***Activity 2.2: Assist PFMC in Designing Enforcement Program***

Sanctuary enforcement personnel will work with the U.S. Coast Guard and the Department of Fish and Game to enforce the prohibition and prosecute violations. This activity will involve educating other deputized enforcement agencies.

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, USCG, NOAA General Counsel

## **Strategy KH-3: State Waters Krill Harvesting Regulation**

### **Strategy Description**

There is currently a ban on harvesting within state waters or landing krill at a state port. This prohibition sunsets in 2011 at which time krill harvesting will be by permission of the Fish and Game Commission. As mentioned in the Background, a bill currently under consideration by the California legislature that would remove this sunset clause and, in the absence of federal regulation, would also prohibit California citizens or licensed vessels from taking krill in federal waters. This strategy will be to partner with other agencies and organizations to explore making the prohibition a permanent one.

### ***Activity 3.1: Explore Permanent Ban Within State Waters***

The Sanctuary will identify other agencies, non-profits, and other institutions that may be interested in making the ban on krill harvesting within state waters permanent. This campaign may be accompanied by an educational effort to create public awareness and support for the legislative action.

*Status:* Phase 1

*Potential Partners:* Department of Fish and Game, Fish and Game Commission, PCFFA, Save Our Shores, The Ocean Conservancy, Point Reyes Bird Observatory, Oceana, The Alliance of Communities for Sustainable Fisheries, Blue Water Network, researchers, NMFS, PFMC

## Citations

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- <sup>1</sup> Pereyra, W.T., W.G. Percy and F.E. Carvey Jr., 1969. *Sebastes flavidus*, a shelf rockfish feeding on mesopelagic fauna, with consideration on the ecological implications.. *J. Fish. Res. Board Can.* 26(8): 2211-2215.

## **Special Marine Protected Areas Action Plan**

### **Goal Statement**

The Sanctuary's goal for special Marine Protected Areas (MPAs) is best stated by language directly from the National Marine Sanctuary Act which outlines one of the overarching goals of the Sanctuary program: "Maintain the natural biological communities in the national marine sanctuaries, and to protect, and where appropriate, restore and enhance natural habitats, populations and ecological processes." In addition, an important goal for special MPAs in the MBNMS is to design them in such a way that they allow for the long-term continuation of sustainable fishing practices in the Sanctuary, as fisheries are a key cultural and economic component of the region.

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Mark Helvey	NMFS, SWR Regulatory

## **Introduction**

Marine Protected Areas (MPAs) are a management tool that may fully restrict harvesting of marine life within a designated geographic area or may allow take of selected species. Scientific research has indicated that carefully crafted MPAs can be effective tools for conservation of biodiversity and habitats. MPAs may be used as a means to restore degraded areas and as a precautionary tool to conserve a range of representative habitats and biodiversity. Well-designed MPAs generally contain higher species diversity, more abundant species, and larger fish within their boundaries relative to impacted areas of similar habitat outside the reserve. These larger fish produce many more young than do smaller fish. MPAs are one of many useful tools that can be used to prevent, slow, or reverse negative habitat and ecosystem changes within the Sanctuary. The NMSP will also consider other management tools that may enable the Program to meet its conservation goals.

The NMSP received many comments during the scoping period of the Joint Management Plan Review (JMPR) requesting increased protection of the ecosystem by taking the lead in implementing a network of MPAs in State and Federal waters. Scoping period comments also asked that regulatory authority on fishing and MPAs remain with existing State and Federal agencies, and that any consideration by the MBNMS of MPAs should be based on consensus with the fishing industry. The NMSP believes that any consideration of MPAs should and will be a joint effort with the participation of many diverse stakeholders, including strong participation of the fishing community to tap into their extensive knowledge and to consider socioeconomic impacts of alternative MPA designs, as well as participation from other agencies, scientists, environmental organizations and the public.

Where MPA processes led by other agencies are underway, such as the Marine Life Protection Act process led by the California Department of Fish and Game, MBNMS staff will be active participants in that process. Although the MBNMS would bring its extensive expertise in ecosystem protection and multi-stakeholder approaches to the issue of MPAs, our initial preference in central California is that the actual designation of any MPAs in state waters be done under the regulatory authority of the California Fish and Game Commission and the Park and Recreation Commission. The MBNMS will participate in and evaluate the outcome of the MLPA process to assess whether it can adequately address the ecosystem and habitat conservation goals of the Program. In Federal waters, there is no similar multi-stakeholder process underway to evaluate the potential for MPAs, although the Pacific Fishery Management Council (PFMC) has previously conducted a conceptual analysis of MPAs. In Federal waters, the MBNMS would work with NMFS, the Pacific Fishery Management Council, the fishing community, environmental organizations, and others to conduct a detailed multi-stakeholder evaluation of the potential for MPAs in MBNMS. The MBNMS has also been actively working with the industry-led Alliance of Communities for Sustainable Fisheries in their evaluation of MPAs, and will continue sharing information and seeking common ground with that group.

## **Workgroup Planning**

To address the issue of properly protecting the Sanctuary's marine ecosystem via MPAs, the MBNMS has developed a Workgroup of the Sanctuary Advisory Council to provide guidance on several aspects of MPAs. Since the MBNMS is a "marine protected area" itself, this Action Plan

is using the term Special Marine Protected Areas to distinguish these MPAs that might limit harvest from within the MBNMS itself.

The Workgroup was asked to outline the framework for providing input to CDFG on the design and implementation of MPAs under the MLPA within the MBNMS region, evaluating the success of that effort and the potential need for further action. The Workgroup also was asked to develop a framework to address the need for, and if necessary, general criteria for and types of special MPAs in the federal waters of the Sanctuary.

The framework describes the process, goals and criteria for effective special MPAs and provides recommendations for an action plan in the revised Sanctuary management plan. Although the revised management plan itself will not specify exact locations for special MPAs, the Sanctuary Program will continue the planning effort in the future with the Workgroup to conduct additional evaluations using the framework document as a guide. Much detailed work remains to conduct a thorough evaluation of the issue, including identification of specific habitats and ecological processes to be protected, identification of potential and existing threats, development of site-specific goals, consideration of design criteria which incorporate biological and socioeconomic issues, integration with other management efforts, and articulation of monitoring, education and enforcement needs.

The Workgroup refined a draft list of future work topics that address these and other issues in the special MPA plan during its meetings in the winter and spring of 2003. This list, shown below, will provide the basis for a longer-term work program for implementation, with continued involvement by the Workgroup.

## **Strategy MPA-1: Conservation Goals and Objectives and Habitats and Resources to be Protected**

### **Strategy Description**

This strategy outlines activities the working group must address in defining more specific conservation objectives for special MPAs, considering the range of habitats and ecological interactions which may warrant protection, and the threats to those resources.

#### ***Activity 1.1: Develop Specific Conservation Goals and Objectives for Special MPA Program, Building on General Goal Statement Above as Part of Ongoing Multistakeholder Process***

*Status:* Phase 1

*Potential Partners:* MPA Group Members, NMFS, CDFG, fishermen, scientists

#### ***Activity 1.2: Consider Range of Representative Habitat Type- e.g. Hard Bottom, Soft Bottom, Kelp Forest, Pelagic, Rocky Intertidal, Estuarine, etc.***

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, Fishermen, MPA Group Members

#### ***Activity 1.3: Identify Key Ecological Interactions, Including Predator-Prey Relationships, Migratory Patterns, Life History Stages, and the Role of Biogenic Habitat (e.g. kelp)***

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, fishermen, MPA group members

#### ***Activity 1.4: Identify Potential or Existing Threats to These Habitats, Resources or Interactions***

*Status:* Phase 1

*Potential Partners:* NMFS, PFMC, CDFG, fishermen, MPA group members

#### ***Activity 1.5: Identify Resource or Habitat-specific Objectives for Special MPAs and/or Network/Collection of Special MPAs***

*Status:* Phase 1

*Potential Partners:* MPA group members

#### ***Activity 1.6: Include Mix of Degrees of Habitat Health Ranging from Areas that are Minimally Disturbed and Set Aside for Protection, to Historically Productive, Currently Underused Habitats Set Aside to Allow Recovery***

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, fishermen, MPA group members



## **Strategy MPA-2: General Design Criteria**

### **Strategy Description**

This strategy outlines the various criteria the working group must describe and evaluate in designing special MPAs, including biological issues, human use patterns, questions of scale and size, and practical implementation issues.

#### ***Activity 2.1: Consider Biological and Physical Factors***

- A. Consider biological factors identified above in Strategy MPA-1.
- B. Consider proximity to ecological “hotspots.”
- C. Evaluate physical oceanographic factors such as currents, upwelling, etc.
- D. Consider biological relationships between State and Federal waters for a network/collection of special MPAs.

*Status:* Phase 1

*Potential Partners:* NMFS, PFMC, Fishermen, MPA Group Members, Local Research Institutions

#### ***Activity 2.2: Consider Human Use Patterns***

- A. Evaluate distribution of human activities on the water. (Phase 1)
- B. Evaluate how locations and distances may impact different user groups and local communities. (Phase 1)
- C. Consider distances from port and safety issues. (Phase 1)
- D. Evaluate potential impacts of displacement of fishing effort to other areas. (Phase 2)
- E. Consider access by other target users, such as divers, kayakers, shore fishermen, researchers. (Phase 2)
- F. Map location of existing small reserves, areas closed to certain types of fishing, and other types of MPAs. (Phase 1)
- G. Consider locations of other types of human threats—e.g. water quality, landslides, vessel traffic, MPWC. (Phase 1)

*Potential Partners:* Fishermen, USCG, Harbormasters, CDBW, CDFG, Fishing Clubs, NOAA Rec. Survey, Dive Shops, Whale Watchers, Kayak Companies, Yacht Associations, MPA Center, NMFS, Divers, Researchers

#### ***Activity 2.3: Address Considerations of MPA Size and Scale***

- A. Ensure that special MPAs are sized appropriately to meet objectives, considering biological and socioeconomic factors.
- B. Consider distances between special MPAs and between types of special MPAs.
- C. Evaluate the need for a network of special MPAs as opposed to individually sited special MPAs.
- D. Determine appropriate scale of a network.
- E. Incorporate variability in special MPA design to improve effectiveness evaluations.

*Status:* Phase 2

*Potential Partners:* Fishermen, USCG, Harbormasters, CDBW, CDFG, Fishing Clubs, NOAA Rec. Survey, Dive Shops, Whale Watchers, Kayak Companies, Yacht Associations, MPA Center, NMFS, Divers, Researchers

***Activity 2.4: Consider Practical Implementation Issues***

- A. Consider proximity and ability to enforce.
- B. Consider ability to monitor for effectiveness evaluation.

*Status:* Phase 2

*Potential Partners:* USCG, CDFG, MPA Center, NMFS, local research institutions

## **Strategy MPA-3: Types of Use**

### **Strategy Description**

Special MPAs may vary from full no-take reserves which allow no harvest to areas which allow some levels of harvest, and areas which allow varying types of non-extractive uses. This strategy outlines the need for the working group to evaluate options for varying types of use in designing special MPAs

***Activity 3.1: Consider mix of options that may restrict various types of extractive and non-extractive activities at selected sites in a special MPA network***

*Status:* Phase 2

*Potential Partners:* Fishermen, CDFG, MPA working group members, NMFS, local research institutions, PFMC, divers

***Activity 3.2: Consider relationship between MLPA classifications and Sanctuary designations***

*Status:* Phase 2

*Potential Partners:* CDFG, MPA working group members, NMFS, local research institutions

## **Strategy MPA–4: Integrated Management**

### **Strategy Description**

This strategy outlines issues the working group must consider in coordinating the development of special MPAs with other types of management measures.

#### ***Activity 4.1: Identify and Evaluate Other Existing or Planned Ecosystem, Fishery, or Land-based Management Tools, as Feasible Within Staff Limitations***

*Status:* Phase 1

*Potential Partners:* CDFG, MPA Center, NMFS, local research institutions, PFMC, fishermen

#### ***Activity 4.2: Identify and Evaluate Gaps, Limits and Constraints of Existing Tools, as Feasible Within Staff Limitations***

*Status:* Phase 1

*Potential Partners:* CDFG, MPA Center, NMFS, local research institutions, PFMC, fishermen

#### ***Activity 4.3: Evaluate Means to Effectively Integrate and Coordinate Special MPAs With These Tools to Leverage and Strengthen Efforts and Avoid Duplication***

*Status:* Phase 2

*Potential Partners:* CDFG, MPA Center, NMFS, local research institutions, PFMC, fishermen

#### ***Activity 4.4: Use Special MPAs to Help Leverage Agency Resources to Address Multiple Threats to Key Sites, Including Land-based Activities***

*Status:* Phase 2

*Potential Partners:* CDFG, MPA Center, NMFS, local research institutions, Cal-Trans

#### ***Activity 4.5: Identify and Consider Possible Synergies Between Land-based Protected Areas (e.g. state parks) and Adjacent Special MPAs For Staffing, Education, Enforcement, Research, or Reduction of Land-based Threats***

*Status:* Phase 2

*Potential Partners:* State Parks, CDFG, MPA Center

## **Strategy MPA-5: Socioeconomic Impact Analysis and Mitigation**

### **Strategy Description**

This strategy outlines activities to assess potential negative and positive socioeconomic impacts of MPAs during the design and post-design stages, and steps to mitigate potential negative effects.

#### ***Activity 5.1: Identify Types of Socioeconomic Analyses to Assist in the Design and Evaluation of Biologically Effective Special MPAs That Will Allow Continuation of Sustainable Fishing Practices and Sustainable Communities***

- A. Evaluate how the community is affected, including cultural and economic sustainability of both consumptive and nonconsumptive factors and values.
- B. Evaluate user groups and ports affected, short and long-term effects, and potential for buffering or reducing negative effects
- C. Consider economic uses that may be improved by designation of special MPAs
- D. Consider social values of a wide variety of different people in evaluating special MPAs

*Status:* Phase 1 for background studies to assist in design, Phase 2 for later studies to evaluate design

*Potential Partners:* CDFG, MPA Center, NMFS, local research institutions, PFMC, fishermen, Socioeconomists, User Groups

#### ***Activity 5.2: Prioritize Studies Needed and Ensure Their Implementation, Including Those Required by NEPA***

*Status:* Phase 1

*Potential Partners:* CDFG, MPA Center, NMFS, local research institutions, PFMC, fisher, Socio-economists, user groups

#### ***Activity 5.3: Work with NOAA and Department of Commerce to Expand/Develop Economic Mitigation Programs for Users That May be Impacted***

*Status:* Phase 2

*Potential Partners:* CDFG, NMFS, local research institutions, PFMC, fisher, Socio- economists

## **Strategy MPA-6: Enforcement and Compliance Program**

### **Strategy Description**

This strategy outlines activities needed to design an effective enforcement program.

#### ***Activity 6.1: Identify Components of an Effective Enforcement Program and Implementation Mechanisms to Provide Adequate Surveillance on the Water and in the Air***

*Status:* Phase 2

*Potential Partners:* CDFG, USCG, State Parks

#### ***Activity 6.2: Develop Partnerships and Cooperative Interagency Enforcement Plans***

*Status:* Phase 2

*Potential Partners:* CDFG, USCG, State Parks, MPA working group members

#### ***Activity 6.3: Ensure Adequate Training of Enforcement Officers in MPA Management and Regulations***

*Status:* Phase 2

*Potential Partners:* CDFG, USCG, State Parks, NOAA OLE

#### ***Activity 6.4: Work to Facilitate Compliance via Tools such as GPS Systems***

*Status:* Phase 2

*Potential Partners:* CDFG, USCG, State Parks, PFMC

#### ***Activity 6.5: Enlist Community Participation in Special MPA Management and Enforcement to Maximize Cost-effectiveness of Enforcement Program and Enhance Compliance***

*Status:* Phase 2

*Potential Partners:* CDFG, USCG, State Parks, community groups

## **Strategy MPA-7: Education and Outreach Program**

### **Strategy Description**

This strategy outlines outreach and education needs during both the design and post-design phases.

#### ***Activity 7.1: Identify Target Audiences and Develop Components of an Effective Education and Outreach Program***

*Status:* Phase 2

*Potential Partners:* SEP, NMFS, CDFG, PFMC

#### ***Activity 7.2: Conduct Regional Workshops to Share Information and Gather Input From Fishing Leaders and the Community After Special MPA Design Criteria are Determined by Multi-stakeholder Groups***

*Status:* Phase 2

*Potential Partners:* SEP, NMFS, CDFG, PFMC, fishermen, MPA working group members

#### ***Activity 7.3: Consider ongoing education potential of individual reserve locations***

*Status:* Phase 2

*Potential Partners:* SEP, NMFS, CDFG, PFMC, local research institutions

#### ***Activity 7.4: Link Efforts to General Education Strategies on Fisheries (a separate working group) and to MBNMS Regional Education and Outreach Plans***

*Status:* Phase 2

*Potential Partners:* SEP, NMFS, CDFG, PFMC, fishing interest organizations, FIRE Working Group

#### ***Activity 7.5: Integrate Education with Enforcement and Research***

*Status:* Phase 2

*Potential Partners:* SEP, NMFS, CDFG, PFMC, USCG, State Parks

## **Strategy MPA-8: Research and Monitoring Program**

### **Strategy Description**

This strategy outlines activities needed to develop a research and monitoring program which will assess and distribute information on the biological effectiveness of the special MPAs and their impacts on patterns of human use.

#### ***Activity 8.1: Design and Conduct Biological Effectiveness Evaluations Linked to Specific Goals of Special MPAs***

- A. Evaluate biological changes within and outside of special MPAs
- B. Include comparisons to adequate control sites
- C. Distinguish between natural and anthropogenic changes
- D. Evaluate potential spillover effect to local populations

#### ***Activity 8.2: Evaluate Human Activities and Changes Relative to Specific Goals of Special MPAs***

- A. Assess consumptive and non-consumptive use patterns inside and outside special MPAs
- B. Determine effects of scientific monitoring
- C. Include observer program on research and fishing vessels
- D. Monitor socioeconomic changes in user groups after special MPAs are established

#### ***Activity 8.3: Coordinate Monitoring and Data Distribution***

- A. Coordinate special MPA monitoring with other biological monitoring in the region and link to MBNMS/SIMoN
- B. Involve fishermen and divers in monitoring activities
- C. Coordinate with other sanctuaries conducting special MPA monitoring
- D. Package and distribute readily understood monitoring information and effectiveness evaluations to decision-makers, fishermen and public

*Status:* Phase 2

*Potential Partners:* NMFS, CDFG, PFMC, local research institutions, fishermen, other stakeholders



## **Strategy MPA-9: Timing Strategies and Phasing / Effectiveness Evaluations**

### **Strategy Description**

This strategy outlines activities for evaluating the potential for phasing in the implementation of special MPAs over time, as well as development of a defined process for adaptive management.

***Activity 9.1: Evaluate Potential Benefits and Disadvantages of Phasing***

***Activity 9.2: If Phasing is Considered Appropriate, Develop Criteria for Establishing a Reasonable First Phase***

***Activity 9.3: Determine Criteria for Frequency of Effectiveness Evaluation of Special MPAs, Linking Criteria to Site-specific Goals***

***Activity 9.4: Establish Criteria for When Evaluations Should Lead to Adaptive Management or Changes in MPAs Based on Improved Knowledge***

*Status:* Phase 2

*Potential Partners:* NMFS, CDFG, PFMC, local research institutions, fishermen, other stakeholders, MPA working group members

Most of the above categories apply to consideration of special MPAs in both state and federal waters. In addition, some specific categories to be addressed for federal or state processes are listed below.

## **Strategy MPA-10: Process and Criteria to Evaluate and Design Special MPAs in Federal Waters**

### **Strategy Description**

This strategy outlines procedures, coordination and additional criteria which the workgroup would need to consider and pursue for MPAs in Federal Waters.

#### ***Activity 10.1: Develop Partners During Evaluation and Design Phases***

- A. Continue multi-stakeholder workgroup for evaluation and design, and allow for continued involvement of local communities
- B. Outline roles and steps for involvement of Sanctuary, NMFS, and PFMC and identify common goals
- C. Develop partnerships with NMFS and PFMC and consider joint staffing during evaluation and design phases
- D. Evaluate linking to and coordination with possible PFMC Phase II consideration of reserves
- E. Ensure coordination with MLPA workgroup considering MPAs in state waters through sharing of information, joint members and possibly joint meetings

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, PFMC, local research institutions, fishermen, MPA working group members

#### ***Activity 10.2: Consider Additional Design Factors for Federal Waters (beyond those in MPA-2 above)***

- A. Define conditions where it is beneficial to extend state MPAs to federal waters, and when separate special MPAs may be more appropriate
- B. Evaluate type and orientation of extension that may be appropriate across state and federal waters, and consider the benefits and disadvantages of doing so
- C. Evaluate potential for separate offshore special MPAs focused on biological hotspots correlated with persistent physical and oceanographic features
- D. Evaluate the persistence of pelagic hotspots over time
- E. Consider practical feasibility of pelagic restrictions, including possibility for temporary closures

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, PFMC, local research institutions, fishermen, MPA working group members

#### ***Activity 10.3: Outline Options for Implementation Process--After Identification of Special MPA Needs, Feasibility and Site-specific Goals, Evaluate the Most Appropriate Process and Agency to Implement***

Options include:

- A. PFMC adopts special MPAs under its own statutory authorities, provided the species covered are addressed by a Fishery Management Plan (FMP)
- B. PFMC is given the opportunity to draft regulations drawing on authorities of the National Marine Sanctuary Act, as outlined in subsection 304 (a)(5) of the Act, allowing it to address species not covered by a FMP
- C. NOAA prepares the draft regulations drawing on authorities in NMSA.
- D. Promulgation of regulations under the NMSA would require amendment of the 1992 MBNMS designation document since regulation of fishing activities is not identified as falling within the scope of current or future regulations. As outlined in the 1992 designation document, any future amendment of the designation document to regulate fishing activity would occur in consultation with fishery management agencies, the fishing community, and the public, and would be subject to formal public hearings, EIS preparation, and Congressional notification requirements.

*Status:* Phase 2

*Potential Partners:* NMFS, CDFG, PFMC, NOAA General Counsel

## **Strategy MPA-11: Process and Criteria to Evaluate and Design Special MPAs in State Waters**

### **Strategy Description**

This strategy outlines procedures for coordination on MPAs in State.

*Activity 11.1: Continue MBNMS Participation in MLPA Workgroup Process to Provide Sanctuary Perspective, Share Information, Collaborate on Development of Recommendations, and Link to Strategies and Activities Recommended Above*

*Activity 11.2: Ensure Coordination with Workgroup Considering MPAs in Federal Waters Through Sharing of Information, Joint Members and Possibly Joint Meetings*

*Activity 11.3: Describe Evaluation of Success of MLPA Outcome, Including Range of Acceptable Outcomes and Timelines for Process*

*Activity 11.4: Outline Multi-stakeholder Alternative Process to be Used if Necessary Pending Evaluation of Success of MLPA Process*

*Status:* Phase 1

*Potential Partners:* NMFS, CDFG, PFMC, local research institutions, fishermen, divers, MPA working group members